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THE LATE WILLIAM DENNY.

The Life of William Denny, Shipbuilder, Dumbarton. By Alexander Balmain Bruce. With Portrait. (London: Hodder and Stoughton, 1888.)

THE late William Denny was in many ways a remarkable man. He was a prominent member of the modern school of naval architects; an ardent advocate of scientific progress in the design and construction of ships; a strong supporter of scientific education in naval architecture; a contributor of many papers and technical data to the various professional institutions of which he was a member; and an eloquent, indefatigable, and effective exponent of his views upon all subjects. He was also the managing partner of one of the largest shipbuilding firms in the world, and was distinguished for his intimate knowledge of the many and intricate details of the business; for his clear insight into, and close grip of, the questions with which he had to deal; for his eager desire to promote good relations among the members of the firm and the various grades of workpeople in their employ; and for what he did all round towards making the business with which he was connected—as he frequently said it was his ambition to do—"a model of efficiency on all sides." Both by practice and by precept, William Denny laboured strenuously and effectively, at all times and seasons, for the advancement of his profession, and for the good of those who wished to qualify themselves for the practice of that profession.

The description of Mr. Denny's work as a naval architect occupies only a comparatively small portion of the present book—108 pages out of 478. The remainder consists of general biographical details, and accounts of Mr. Denny's views upon the many local, and the various political, social, moral, and religious questions in which he had a strong—we may say a burning—and ever-increasing interest. This general record of his acts and words will be valued by those who knew the man, and who admired and loved him—as none who really knew him could help doing—and will give to others who may read it a good idea of a life which was full of activity, interest, and promise.

It is, however, the professional work of the subject of this memoir, and not his vigorous, cultured, many-sided, full, and keenly sympathetic mind and life, that we have to do with here. Prof. Bruce, the author, says that the five chapters (VI.–X.) which deal with this branch of his subject "present a popular account of Mr. Denny's technical work, written by one who possesses no knowledge of the technic of shipbuilding." But they do much more than that, as will be inferred from the fact that Prof. Bruce availed himself of assistance by such competent authorities as Mr. Robert Duncan, the well-known Port Glasgow shipbuilder; Mr. Martell, the Chief Surveyor of Lloyd's Register Society; and Mr. F. P. Purvis, the Chief of the Scientific Department in Messrs. Denny's shipyard.

The name of Mr. Denny is inseparably associated with modern progress in scientific naval architecture. Prof. Bruce says truly that "in naval architecture he was sometimes in fact, and always in spirit, a pioneer, . . . sagacious to discern quickly the value of a new suggestion or invention, prompt to give it generous recognition, energetic and enthusiastic in taking it up and developing it until it had gained a secure place in general thought and practice;" and he "was of that earnest temper that must and will improve where improvement is possible."

Mr. William Denny belonged to a family of shipbuilders. "He was the third in succession of three Williams, of whom the two first, his grandfather and his uncle, had been men of genius in the art of shipbuilding." His grandfather started shipbuilding on his own account in Dumbarton, in 1817, when there was no shipbuilding yard on the Clyde above Dumbarton. He gained renown, during the infancy of steam navigation, as the builder of the Thames passenger-steamer *Marjory*, and of the mail-steamer *Rob Roy*, the first sea-going steamer built, which was employed at first in the Glasgow and Belfast trade, and afterwards as a passenger-vessel between Dover and Calais. He also built the *Trinidad*, the first steamer sent to the West Indies. This William Denny had seven sons, all of whom became shipbuilders. The sole survivor of the seven is Mr. Peter Denny, the father of the subject of this memoir, and the head of the shipbuilding firm of Messrs. William Denny and Brothers, and of other important commercial undertakings, whose long and honourable career and high personal qualities have obtained for him, to an unusual degree, the confidence and esteem of all who know him. Mr. Peter Denny's brother William started the present firm of William Denny and Brothers in 1844. He applied himself with great skill and success to the use of iron in shipbuilding, and in ten years he created a prosperous business. His death occurred at the same early age as that of his nephew, viz. not quite forty years.

The late Mr. William Denny's contributions to the science of naval architecture relate mainly, though not entirely, to the resistance, speed, and propulsion of ships, the stability of ships, the use of steel in construction, and to improvements in structural details and arrangements He was struck by the report of the British Association Committee in 1869—and particularly by the separate report of Mr. Froude—upon the subject of resistance, and the best way of determining by experiment the relation between speed and power in ships. Mr. Froude enunciated in his separate report the law which connects speed with resistance in floating bodies of varying size but similar forms, and enables the resistance of a full-sized ship to be calculated from that of a small model. He also showed graphically, in the shape of curves, the true variation of resistance with speed, as determined by experiment, for ship-shape models of various forms. Both these points were seized hold of and utilized at once by Mr. Denny for practical application. In January 1870, he commenced to test the speeds of steamers progressively on the measured mile, *i.e.* to determine the relation between engine power and speed at several speeds from the lowest to the highest, and to plot curves, similar to those made by Mr. Froude from model experiments, that showed the true variation of power with speed over the whole practicable range of

speed, in the vessels so tried. Previous to that time it had been generally considered that it was sufficiently accurate for ordinary purposes to ascertain the power necessary to drive a ship at one or two different speeds only, and to assume that the resistance at other speeds would vary as the square of the speed. The errors often involved by this assumption were known to be considerable; but the practice was not improved upon until the introduction of Mr. Froude's curves of resistance for models, and Mr. Denny's corresponding curves for actual ships.

In 1873, Mr. Denny entered into correspondence with Mr. Froude, and communicated to him from that time forward the results of his experiments upon the speed of ships. Those results, when compared with what were given by model experiments, were of great assistance to Mr. Froude in his investigations. Mr. Froude said, at the Institution of Naval Architects, in 1876: "Mr. Denny's horse-power results, when closely scrutinized, were found at once to supply most important information on the subject of engine friction; and they have helped to corroborate and further elucidate certain general conclusions on the subject of the expenditure of power in propulsion, which other less crucial tests had enabled me to arrive at approximately." Mr. Froude read a paper, from which the foregoing is a quotation, in which he used the data referred to for determining the ratio of indicated to effective horse-power in ships. He also read a second paper, at the same meeting, in which he said that "the trial of Mr. Denny's ship *Merkara*, referred to in the paper I have already read, furnished materials for extending and giving practical completeness to a comparison [of the resistances of long ships of several types] which our series of experiments had already led us to institute between several types of form." This furnishes an excellent illustration of how progress may be facilitated by the close co-operation of the scientific investigator and experimentalist with the practical worker who requires to understand and apply the teachings of science; and it is one proof out of many of the scientific value of Mr. Denny's early speed trials, and of his readiness to communicate freely the results to others interested in the subject. Mr. Denny laboured with great enthusiasm to perfect the data obtained on measured mile trials of ships, and to collect and record it systematically; and he was always ready to place such information at the disposal of other workers in the same field.

Mr. Denny read a paper, in 1875, before the Institution of Engineers and Shipbuilders of Scotland, on "The Difficulties of Speed Calculations," in which he strongly insisted upon the uselessness of the ordinary speed formulas, and urged the desirability of having all steamers, if possible, tried progressively. He gave conclusive force to his arguments by exhibiting curves of power and speed for several ships, which showed large departures of the curves given by the standard formulas from the curves which had been deduced from actual trials of the ships. He never afterwards ceased to call attention to the great advantage of the improved system of speed trials; and he soon had the satisfaction of seeing it brought into general use. Mr. Froude said, in 1876, in one of the papers above referred to: "It is to Mr. Denny's honour that, finding the so-called constants [in the speed formulas then in use] were invariably variable and inconstant, he determined of himself to strike out a new line, and find out by trial what is fact, instead of contenting himself with assuming what ought to be the relation between indicated horse-power and speed."

In 1881, Mr. Denny, with the consent of his partners, took the important step of erecting an experimental tank in the shipyard at Dumbarton for the purpose of carrying out independent trials of the resistance of models such as Mr. Froude had long been doing at Torquay. So long before as 1877 he said at a meeting of the Institution of Naval Architects: "The attention of all mercantile naval architects should be called to the fact that all Mr. Froude's experiments bear strongly and directly on our work; and unless we follow them thoroughly and follow them accurately, and with an anxious spirit, we shall not succeed as we ought in taking the lead of those countries interested in shipbuilding." His biographer says that in 1881, when a large extension of the Dumbarton shipyard was commenced, "the erection of an experimental tank became a subject of serious consideration with Mr. William Denny. He had become convinced that the expenditure involved in the construction and maintenance of such a tank would be justified by its utility. The result was that the present Dumbarton tank, the only one either in existence or in contemplation under private control, was devised, constructed, and equipped." The magnitude and difficulty of the work will be understood when it is remembered that the water-space contained in the so-called tank is 300 feet long and 22 feet broad, and the depth of water 9 feet; that the models experimented upon are fashioned out of solid paraffin by mechanism originally devised by Mr. Froude for the purpose; and that the models are towed from end to end of the tank by means of an overhead carriage fitted with delicate apparatus for accurately measuring the speed of the model and the force applied to maintain it at that speed, and for automatically producing a graphic record, in a form suitable for subsequent measurement and calculation, of the results of each experiment. The outlay and thought demanded by such an extensive, complicated, and novel undertaking was very great; but the greatest difficulty of all would be the formation of a staff competent to make it fruitful and successful in results. Mr. Froude was a man of genius, and everyone could not work with his tools. However, Mr. Denny soon organized a staff of skilled assistants who have proved their fitness for the task to which they were put. Prof. Bruce says that "since the tank was opened some twenty thousand experiments have been made on models of ships previously built and tried on the measured mile, or of ships in process of design, or of ideal ships conceived for the purposes of experiment."

Mr. Denny did much to simplify and improve the methods of calculation for determining a ship's stability, and to apply the known science of the subject to the practical work of the designing office. In 1880 he commenced the practice of ascertaining by experiment the position of the centre of gravity of every ship built by his firm; and the data thus obtained for numerous ships were perfected and carefully systematized for guidance in the preparation of new designs. Amsler's mechanical

integrator, and other mechanical devices for reducing the labour of calculations made in a naval architect's office, were extensively used; and the time required for such work was reduced to a small fraction of that formerly expended. The integrator was modified by its inventor at Mr. Denny's suggestion, so as to be better fitted for the special work of stability, and other, calculations; while, on the other hand, the integrator was used so as to enable large simplifications to be effected in the systems of calculation. The manner in which the mechanical integrator was used in Mr. Denny's office to reduce the time and labour involved by laborious calculations, and to effect improvements in the methods of calculation themselves, is well illustrated by one of Mr. Denny's most valuable contributions to the science of naval architecture, which is contained in a paper on "Cross Curves of Stability, their Uses, and a Method of constructing them obviating the Necessity for the Usual Correction for the Differences of the Wedges of Immersion and Emersion."

Mr. Denny, as was his custom throughout, gave a practical direction to his work in connection with the subject of stability, by preparing for each steamer built by his firm general particulars of her technical qualities, "such as dead-weight capability, speed and power, stability," and other matters of importance, for the guidance of her owner and captain.

Mr. Denny was one of the most prominent advocates and pioneers of the recent change from iron to mild steel as the material of a ship's construction. He was the builder of the *Rotomahana*, the first mercantile ocean-going steamer constructed of the new material—a vessel which soon answered objections made to the use of steel by grounding on a rocky bottom and proving its superiority over iron when subjected to the roughest of treatment. Mr. Denny showed, in a paper read before the Iron and Steel Institute in 1881, that the extra cost of steel per ton would be more than counterbalanced by savings effected in the weight of structure, and by the additional weight of cargo that could thus be carried. The truth of this view was soon proved by the commercial results of the use of steel ships. He was always a consistent advocate of the use of steel, and a stout upholder of its merits against all attacks; and he often pointed out with great force and truth that defects arising from faulty design or bad work had been attributed to the material itself. Hence he strongly urged the necessity for more careful study of structural defects, and of what he called the "morbid anatomy of ships."

It is impossible, within the space at our disposal, to deal thoroughly with, or even to notice all of, the many subjects associated with Mr. Denny's name. He did much to improve the structural details of design, and to bring about the introduction of double bottoms into mercantile steamers. He was always an able and close critic of the rules by which Lloyd's surveyors are guided in the survey of ships for classification, and of the manner in which those rules are carried out. He proposed, in 1877, to frame new rules, by which the displacement of a vessel would be the standard for regulating the thickness of the plating and the sizes of the frames and other parts. Mr. Denny's arguments were met with what, at the time, may have been a sufficient answer, viz. that there were no fixed load-lines for ships, and therefore there was no definite amount of displacement. This answer does not now hold good, however, seeing that since the report of the Load-line Committee, in 1885, full means have been in operation for fixing the load-lines, and therefore the displacements, of ships. But there still remains much to be said, on both sides, about Mr. Denny's proposals.

Mr. Denny did some very valuable work as a member of the Load-line Committee, a description of which will be found in Chapter IX. In that Committee; at an interview with the President of the Board of Trade in 1883; in giving evidence before the Royal Commission on Loss of Life at Sea in 1885; and on all other suitable occasions, Mr. Denny advocated a reform of the Marine Department of the Board of Trade, in the direction of forming a Board whose members would have personal knowledge of the subjects dealt with and the interests affected by them, and of strengthening the executive staff of that Department by furnishing it with the best scientific assistance that could be procured.

The cause of technical education never had a stronger supporter than Mr. Denny. He advocated it, and worked in it, at all times and seasons. Everyone engaged in the scientific teaching of naval architecture had his eager encouragement and generous help. The writer owes much to him for practical assistance of every kind in connection with the commencement and carrying on of the work of the Chair of Naval Architecture in Glasgow University. Mr. Denny was always ready to apply the resources of his establishment to the benefit of others who were working in the cause he had at heart. He was an ardent advocate of technical education for all who were entering the shipbuilding profession. His own early training was very thorough, and he qualified himself, as the record of his work proves, to occupy the first rank among naval architects. Yet we find him dissatisfied, and saying in 1883 to one who consulted him as to sending a son to the Royal Naval College, "None of the rest of us [the exception referred to is his brother Mr. Archibald Denny, who now ably fills his place at the works] were at the College, and it will be a lifelong regret to me that I missed its advantages. . . . The work of these schools [of naval architecture] is the leaven which is slowly but profoundly inspiring and changing the character of our profession." The practical efforts made by Mr. Denny himself among his own people to improve their technical training are best described in his own words. In 1883, he said:—

"Our attempts at technical education in our shipyard and engine-works consist of the following:—

"(*a*) Rules as to the admission, by examination, of apprentices and others into the shipyard offices.

"(*b*) The same for our engine-works.

"(*c*) Rules to the Awards Committee to guide them in rewarding the workmen for inventions or improvements.

"A similar scheme of awards has been begun in our engine-works.

"From these papers and the private information given to you as to the awards made, you will observe that our attempts to stimulate the intelligence of our *employés* have developed in two forms, corresponding to the main divisions of these *employés*. First, by examination we have tried to secure a supply of apprentices and others for our offices elected by ability and steadiness, and with some knowledge suitable for the careers before them.

Second, we attempt by rewards to stimulate the minds of our workmen directly to invention and to a continual criticism of the methods of work, tools, and machines employed by them. We have not tried yet to induce them to attend technical classes, but a few of them do attend such classes in the town, conducted under the control of the Science and Art Department.

"All our draughtsmen attend such classes, and in addition have from us the use of our offices, with paper, &c., free, also of a very complete library of works on naval architecture and cognate subjects, every evening excepting Saturday and Sunday."

Mr. Ward, the managing partner of the firm, reported, in 1887, that, since the introduction, seven years before, of the system of awards to workmen for inventions and improvements, "claims have been considered valuable and worthy of award to the number of 196, while rather more than three times that number have been considered altogether."

Want of space prevents our saying more respecting the subject of this memoir, though much more might be said with advantage. The early termination of Mr. Denny's career is an irreparable loss to his profession and to the cause of scientific progress in ship construction. The last professional distinction conferred upon him was that of being elected President of the Institution of Engineers and Shipbuilders in Scotland; but he did not live to deliver his Presidential address. This circumstance in connection with his death is similar to what happened in the case of a celebrated predecessor in that office, also a Clyde shipbuilder. We refer to Mr. John Elder, who died in the prime of life almost immediately after the members of the Institution elected him as their President in 1869. FRANCIS ELGAR.

MEMORY.

Memory: its Logical Relations and Cultivation. By F. W. Edridge-Green, M.B., B.S. Durham. (London: Baillière, Tindall, and Cox, 1888.)

THE title of this book is somewhat misleading. "Memory: its physiological" or "organic conditions," would be more pertinent, for "logical relations" suggest a treatment of mental association more allied to that offered, for instance, by Dr. Bradley in his "Principles of Logic." This will probably appear a trifling remark to the author, niceties of terminology seemingly being of small importance in his eyes. Throughout his work the writer lightly passes from the corporeal to the mental sphere with a serene indifference to the needs of clear conception.

The author's stand-point may be understood from the following paragraphs of the introduction:—

"What is memory? It is the process by means of which impressions of the external world and ideas are retained for use on future occasions. . . .

"Memory must be clearly distinguished from remembrance and recollection. Recollection is the power of voluntarily recalling impressions. Remembrance is the term applied when the process is involuntary. Memory is the innate power to have an impression recalled if a proper stimulus be applied. . . .

"All the above appears at first sight to be strongly against the view that memory is a definite faculty occupying a limited portion of the brain. But in the following pages I shall endeavour to prove that memory *is* a definite faculty, and has its seat in the basal ganglion of the brain, separate from, but associated with, all the other faculties of the mind."

Mr. Edridge-Green evidently does not fear the reproach of heresy, for there is hardly a sentence of the foregoing that would not be condemned by the authorities of the day. Whether memory be defined as "the process by means of which impressions and ideas are retained," or "the innate power to have an impression recalled" (we leave it to the author to reconcile his own language), —to mark it off from "remembrance and recollection" would, by most psychologists, be regarded as making a distinction without a difference. And, further, to maintain that "memory is a definite faculty occupying a limited portion of the brain," with "its seat in the basal ganglion," undoubtedly is a proof of independent opinion, if not of scientific discretion.

We are treated in chapters v. and vi. to an account, at some length, of "the faculties of the mind," as well as —although we had been told that memory is *a* definite faculty occupying a limited portion of the brain—of "the special memories" appertaining to the same. The faculties turn out to be thirty-seven, the number being five short of those alleged in "the phrenological system," the items of which are in part rechristened, and also rearranged. Regarded as conformity to popular description, there may be no great harm in all this; but something more than language is at fault in the statement that "the mind is made up of a number of faculties, each of which responds to certain impressions, and influences the mind as a whole to seek after these impressions, and to avoid their negatives." Indeed, many of the author's perplexities, and much of the reader's difficulty in comprehending him, are clearly traceable to the adoption of this somewhat antiquated and crude way of regarding the mental constitution. The topic, however, must not detain us, and we proceed to consider the author's refutation of "the hypothesis that the perception and memory of any impression occupy the same portion of the brain."

Eight reasons are apparently offered. No. 1 had perhaps best be given in the author's own words:—

"They [*i.e.* perception and memory] are totally distinct functions; thus, the eye receives the impression in the first place, but no one supposes for an instant that the eye is the seat of the memory of impressions of sight. . . . Why should the brain, having manufactured ideas, &c., remember them? The cerebral hemispheres bear exactly the same relation to the basal ganglia as the external senses do, and there is no evidence to support the theory that the cerebral hemispheres are the seat of memory."

The reasoning apparently is: the cerebral hemispheres (which possess the property of *manufacturing ideas*) stand "exactly in the same relation to the basal ganglia as the external senses." Now it is admitted that the eye, or external sense, remembers nothing, therefore neither can the cerebral hemispheres. Is this meant for reasoning, or mere dogmatism? No one who has not a theory to support would press the analogy of the eye and the cerebral hemispheres; resting as it does on nothing better than a vague resemblance of the minute structure of retina and cortex; rather, if analogy is to count for anything, it is the "basal ganglia" that should be likened to

the sense-organ, for their part, if not whole, function in the perceptive act is mediatorial.

Argument 2: "The view that the memory of an impression occupies a part of the brain distinct from the perception is simpler and more consistent than superadding the function of memory to that of some of the faculties. Thus, why should the instinct to acquire and its special memory occupy different portions of the brain, whilst the perception of a form and its memory occupy the same portion?" But who but our author alleges that they do occupy different portions?

Most of the other arguments turn upon the implications of the faculty-hypothesis, and lose whatever force they seem to possess by the abandonment of that mode of conceiving mental phenomena. Thus, No. 5: "The absolute impossibility of understanding how an impression could be split up, so that each faculty might take its share of an impression." Material separation of faculty-areas apart, one does not readily see the point of this difficulty.

Our author says: "I will take for illustration the faculty of colour, as being the *very simplest* possible; but by no stress of imagination can I conceive how an impression of colour can exist, apart from the impression itself, to be of any definite use in remembrance." The reader's imagination will very likely be as much taxed as the writer's; indeed, he will probably vainly try to imagine what the author is exerting himself to imagine. After much straining, I seem to myself to seize the intended meaning in the following rendering. The mind being regarded as an aggregate of distinct faculties, the *matter* of any impression will be simultaneously apprehended by several. Now the energy of a faculty is a function of the hemispheres. But that which is common to several faculties cannot be the exclusive property of any one. In remembering, the perceiving faculty is dormant; therefore, in remembering, some other region of the brain must be excited.—But how if the initial assumption be denied, and memory of the perception be no other than the perception *minus* the outlook? Is this not sufficiently proved by the fact that there can be no memory where there never was presentation; and that remembered presentation can, in certain circumstances, attain the intensity of original presentation?

But if mental revival be not the subjective concomitant of renewed cerebral agitation of a definite kind, how ought we to conceive the state of the case?

Thus: "all sensory impressions, whether elaborated by the faculties of the mind situate in the cerebral hemispheres or by the sensory nerves, are permanently stored up in the optic thalami, and constitute the sensory memory"—the equivalent of psychical retentiveness. Then these stored-up impressions find a way out of their hiding-places through one of two opportunities. Either when some similar impression passes "through the sensory memory centre on its way up to the mind" (= remembrance); or "through the intervention of the mind" (=recollection). The writer shows no signs of having thought out all that his descriptions imply. As for the relegation of the function of memory to the basal ganglion, nothing deserving the name of evidence is forthcoming.

In his treatment of memory in the strictly subjective aspect, Mr. Edridge-Green shows to more advantage, although a certain want of lucidity here as elsewhere forms a serious defect. He instances three laws of remembrance, which must be given in his own words:—

First Law.—"All impressions tend to revive those of a similar character previously received; but an impression in the sensory memory will not be brought before the consciousness if its psychical intensity does not reach a certain definite standard. This psychical intensity is attained by the association of impressions representing similar members of a psycho-physical series contiguously combined in a similar manner."

The law seems to amount to this: As the points of similarity in two impressions, one old and one new, increase, is the chance of recognition increased. So interpreted, it is the equivalent of what is frequently called by psychologists the law of Similarity. The law as stated by our author involves, however, his third law, or that familiarly known as the law of Contiguity.

The similarity referred to in the first law detached from contiguous association is made the subject of the second law of remembrance, which runs—

"When an impression is received similar to one received previously, unless the previous impression be revived at the same time, both impressions will remain separate; whereas if the previous impression be brought before the consciousness and recognized as similar, an association of the two impressions will take place."

The implication of this law is that the similarity of impressions alone does not suffice for revival. Over and above the resemblance of the impressions themselves there must be a perception of the resemblance. One would have thought, indeed, that this went without saying. Physical similarity or even identity is not conscious perception of resemblance. The students who did not recognize the leaf of a plane-tree, although they had been staring at it every day of their lives, had never had in the psychological sense an "impression" of the plane-leaf. The image on the retina preceded no mental image; and when their attention was called to the plane-leaf, they may be said to have then *seen* it for the first time. But having cognized it once, they cognized it always, according to a well-known dictum that cognition and re-cognition are one and the same.

This second law is no pure law of remembrance, then, but a fundamental condition of knowing.

Third Law.—"The revival of a component of an impression tends to the revival of the remaining components, and the revival of any impression tends to the revival of other impressions received about the same time; but unless these reach the necessary standard of psychical intensity, they will not be brought before the consciousness."

This is a not unhappy wording of the great law of mental association, the "law of contiguity."

As a statement of principles, whether physiological or psychological, I cannot hold this book on the mysterious subject of Memory to be a valuable contribution to scientific literature. There is evidence throughout of first-hand observation and of genuine effort to acquire an original comprehension of both physical and psychical phenomena, but the materials are ill-arranged, and the theorizing crude or mistaken. It might be well if the author, before pursuing his inquiries in this field, made

himself more acquainted with the present condition of physiological and psychological research.

The most satisfactory part of the book is the concluding section, entitled "The Cultivation of Memory," wherein some excellent practical advice is given with regard to methods of acquisition and study, the adoption of which would save much commonly wasted time and labour.

W. C. COUPLAND.

THE SPECIES OF FICUS OF THE INDO-MALAYAN ARCHIPELAGO.

The Species of Ficus of the Indo-Malayan and Chinese Countries. Part II. Synœcia, Sycidium, Covellia, Eusyce, and Neomorphe. By George King, M.B., F.R.S., &c. *Annals of the Royal Botanic Garden*, Vol. I. Part 2, pp 67–185, tt. 87–225. (Calcutta: Printed at the Secretariat Press. London: L. Reeve and Co. 1888.)

THE first part of this excellent illustrated monograph of a very difficult genus was reviewed in NATURE, vol. xxxvi. p. 242, where some details are given of the classification adopted by Dr. King. The present part completes the volume; but it is intimated that a supplement is to follow, dealing with the new species recently collected by Mr. H. O. Forbes in New Guinea, and containing an account of the fertilization of *Ficus Roxburghii*, by Dr. D. D. Cunningham. A photograph of a tree in fruit of this remarkable species forms the frontispiece to the volume. It is one of those species which bear the fruit on the trunk; and in this particular tree the fruit is heaped up around the base of the trunk in such profusion as to suggest the idea of its having been placed there. Several species of the section *Covellia* exhibit this peculiarity; and some even go farther and bury their fruit in the ground, where it ripens, like the earth-nut *Arachis hypogœa*. *Ficus conglobata*, King, and *F. hypogœa*, King, belong to this group. The former bears enormous clusters of figs, which are wholly or partially buried in the soil; and of the latter, Mr. H. O. Forbes, who collected it in Sumatra, at an altitude of 5000 feet, says "the fig-bearing branches issue from the stem very near the ground, and at once become sub-terrestrial, producing figs either entirely or partially buried. These figs when very young are devoid of colour in the upper half, but pinkish in the lower half. When a little older they become reddish-pink all over, and when mature they are of a greenish-grey colour."

Another highly curious species is *Ficus Minahassæ*, Miquel, a native of the province of Minahassæ in the Celebes. Miquel truly says this is "Omnium Ficuum maxime singularis." The figs (receptacles) are only from one-tenth to one-fifteenth of an inch in diameter, crowded together in little balls, about an inch in diameter, and borne on long slender pendulous leafless branches.

Ficus hispida, Linnæus, is one of the commonest species throughout tropical Asia, and extends to North Australia and Hong Kong. It is also very variable, the variability being in a great measure due to the different situations in which it grows. This species bears the receptacles (figs) in pairs in the axils of the leaves, or in clusters on the trunk, and sometimes they occur in both positions on the same tree at the same time. The fruit from the trunk sometimes burrows in the ground, and Roxburgh seems to have been the first to record the phenomenon. On the sandy lands near the sea on the coast of the Tanjore country, he states, the whole raceme and fruit are often entirely underground. Whether it was for this reason or not that this variety received the name of *F. Dæmonum* is not mentioned, but Vahl gave this name to specimens collected by Kœnig.

With regard to the execution of the second part of Dr. King's monograph, more especially the lithographs, the work of native artists, there is, if anything, an improvement on the first part; and the dissections are throughout on the same plate as the species to which they refer (instead of on separate plates as in the first part), which is much more convenient. The total number of species described is 207, many of them new; though, on the other hand, Dr. King has reduced a very large number of species founded by other authors, especially by Miquel, on fragmentary herbarium specimens. In several instances two species were founded on the different sexes of the same species, based upon differences in the shape and other characters of the receptacle. On this point it may be mentioned that Count Solms's and Fritz Müller's investigations of the sexual relations of the fig and caprifig, and the investigation of other species by the former, had led botanists to expect greater diversities in the male and female receptacles than would appear from Dr. King's researches to exist. He says:—"In by far the majority of cases these two kinds of receptacle [*i.e.* male and female], so physiologically distinct, are undistinguishable by external characters, and they are borne by the same individual plant. They look exactly alike until one opens and examines their contents. The most notorious of the few exceptions to this rule is the common eatable fig (*Ficus Carica*)." These differences have been fully discussed from time to time in NATURE. What is more surprising than this sexual similarity is that in certain species having dimorphic receptacles, the dimorphism Dr. King finds bears no relation to the separation of the sexes. For example, *Ficus trachycarpa*, Miquel, having spherical verrucose receptacles, Dr. King considers to be the same species as *F. clavata*, Wallich, which has larger ovate or obovate receptacles; and he says:—"There is no absolute sexual relation between the external form and the contents of the two kinds of receptacle which occur in this species; but, so far as I have observed, the large obovoid clavate receptacles invariably contain male and gall-flowers, and the males are not confined to a zone near the mouth, but are to be found on all parts of the interior of the receptacle. Of the small subglobular receptacles, however, some are exclusively filled with fertile female flowers, while others (like the large clavate receptacles) contain males and gall-flowers mixed together." One would almost suspect an error in the identification of these two forms as one species, though in foliage they are absolutely alike.

But, apart from all physiological considerations, it is a matter for congratulation that this useful work has been completed, and Dr. King has earned the thanks of all his fellow-botanists.

W. B. H.

OUR BOOK SHELF.

Questions and Examples on Elementary Experimental Physics. By Benjamin Lœwy. (London: Macmillan and Co., 1888.)

THIS book contains some 470 questions and examples in elementary physics, selected from the various papers set by the author for the examinations of the College of Preceptors. The questions are arranged under the four sections, sound, light, heat, and electricity and magnetism, and are further subdivided in each section into groups of five or six, with the suggestion that each group should form the subject of an ordinary school lesson. Problems involving a knowledge of mathematics beyond elementary arithmetic and geometry are avoided; in other respects the general standard of the questions is about that of the advanced stage of the Science and Art Department's examinations. The questions are well selected, and free from ambiguity or repetition. We notice under Heat, ix., 1, the question: "In the process of graduating a thermometer, why must the freezing-point be determined before the boiling-point?" This is the order of operations as usually given in the text-books, but it has been shown in the elaborate report of the Bureau des Poids et Mesures that the interval between the freezing and boiling points is most constant when the freezing-point is determined as soon as possible *after* the boiling-point.

We can recommend this little book to the attention of those teachers who have to prepare pupils for the public examinations in elementary physics. For success in such examinations it is not sufficient that the pupils should possess the requisite amount of knowledge: they must also acquire the power to express their knowledge clearly and concisely on paper, and such power it is one of the functions of such a book as this to impart.

H. H. H.

The Unknown Horn of Africa. By F. L. James, F.R.G.S. (London: G. Philip and Son, 1888.)

THIS is an extremely interesting record of an exploration from Berbera to the Leopard River, undertaken about four years ago. Various attempts had been made, before Mr. James's journey, to penetrate to the interior of Somali Land, but without success. Mr. James and his companions, more fortunate, or more skilful, than their predecessors, contrived to push their way to the goal for which they started; and the result is that the present volume is accompanied by a map embodying much new information regarding a district of considerable extent and importance. Some of the difficulties encountered by the party were formidable, but courage and perseverance enabled the travellers to overcome every obstacle. Mr. James has much to tell us about the flora and fauna of the country, as well as about its physical features; and he has many lively and instructive passages describing his relations with the natives, whose peculiarities he seems to have thoroughly understood. The story is itself so interesting, and is told in so bright and pleasant a style, that the book ought to be one of the most popular of recent works of travel. It is illustrated by a number of excellent coloured plates, and by various effective pictures, composed from photographs of natives and native scenery taken on the spot.

Seas and Skies in Many Latitudes. By the Hon. Ralph Abercromby. (London: Edward Stanford, 1888.)

THIS is not an ordinary book of travels. It has been written mainly for the purpose of calling attention to such phenomena of the sky and weather as Mr. Abercromby has observed in various parts of the world. The opening chapter describes the author's experiences in Canada and the United States in the year 1865. Then he gives an account of a voyage round the world, beginning with what he saw in Egypt, and passing on to descriptions relating to Australia, New Caledonia, Fiji, New Zealand, Cape Horn, and Rio Janeiro. Mr. Abercromby next takes his readers within the Arctic Circle, and afterwards he tells of a long journey, in the course of which he was at the Cape of Good Hope, Mauritius, Ceylon, the Himalayas, Borneo, Manilla, San Francisco, and Washington. He by no means confines his narrative to matters specially attractive to meteorologists. He takes interest in many different classes of subjects, and has something more or less memorable to record about almost all the places he has visited. It is, however, meteorology that he keeps chiefly in view, and we need scarcely say that on this subject, which he has so long and carefully studied, his book is always fresh and instructive. The value of the work is increased by good maps and illustrations.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Alpine Haze.

WITH the caution of a true man of science, Prof. Tyndall has given this name to a phenomenon observed by him in the Alps. Does not W. Clement Ley beg the question by calling it "dust-haze"? I should translate his *nebula arida* by "dry haze."

Two hundred years ago, Ludolf gave the best definition of *qobar* by translating it: "*opacitas aeris qualis solet esse tempore fervidissimæ æstatis.*"

In my last letter I quoted several names of it, in order to show that the vulgar eye has long distinguished this phenomenon. I have since learnt that, in the Basque dialect of Gipuzkoa, its proper name is *bisuntsa*, but that seafarers call it *lur-autsa, i.e.* "earth-haze," *lañoa*, meaning common fog. The Ethiopic name, *qobar*, comes from *qabara*, a root extant also in Hebrew and Arabic, and meaning *to bury*. *Qobar* hides the landscape, and conceals stars of the third magnitude, even in the zenith. Gasparin observed it on Mount Ventouk, where he crossed a thick cloud which made no impression on his hygrometer. Humboldt, viewing *qobar* in Peru, says, "Quelle est cette vapeur qui est visible et qui ne mouille pas?" but leaves his question unanswered.

While travelling in Spain, Willkomm remarked *qobar* at a distance of 3 or 4 miles, yet, on reaching the actual spot, he saw nothing. He clearly distinguished it from the *landrauch* ascribed to smoke caused by turf burning in Westphalia, and thinks, like Spaniards, that *callina* increases with solar heat. Several German authors have spoken of this phenomenon as smoke, but Egen is the only one who has followed it up from place to place through an extent of 200 kilometres, and rendered it probable that it then covered a space of more than a thousand square myriametres. It seems, however, that particles of smoke should attract moisture, if there were any in the air, and then form real clouds or otherwise fall to the ground by increase of weight.

Bravais saw *qobar* on the Faulhorn, when his hygrometer was at 51, air saturated with moisture marking 100. In Ethiopia, where I have observed it so low as 20, the hygrometer's mean reading was 41 when *qobar* was conspicuous. Above 72 it disappeared. These figures apply to the place of observation. Conclusions can be safely drawn only when the air's moisture shall have been measured in several places along the line of sight up to the spot where *qobar* prevails, or, better still, in that spot itself when recognized from a distance.

Since I published my first account of *qobar*, Martins, who observed it in Auvergne, Switzerland, and from Mount Canigou, is the only author who has specially described it. He says that the Swiss call it *hâle*, and that he saw none of it in Lapland. In spite of Kaemtz's remark that, moisture being the essence of all fogs, a "dry fog" is an expression not less un-

meaning than a "triangular square," Martins divides his "*brouillards secs*" into four classes, viz. volcanic ashes as seen in the year 1783; smoke from turf or stubble fires; *callina* or *qobar*; and a fourth kind established on negative evidence which seems untrustworthy.

W. Clement Ley has described quite well the hues of *qobar*. It is light buff when near or slight. Otherwise, its colour is a lurid gray verging to blackness. Whatever may be its connection with cumuli in England, I could detect nothing of the sort in Ethiopia, where I have watched *qobar* for whole weeks without any ensuing rain or even cloud.

Four years ago the French transit of Venus expeditions agreed to investigate the amount of carbonic acid gas in the air of their several stations. Mine was in Hayti, where *qobar* was rife, and while observing for many consecutive hours the passage of air through caustic potash in prepared tubes, I regretted their not being made to receive plugs of loose cotton in order to collect smoke, dust, or microbes. All the tubes having been subsequently tested in Paris by Prof. Müntz, he obtained the unexpected result that air contains more carbonic acid in the southern hemisphere than on the north of the equator. Those tubes inclosed also fragments of pumice-stone previously steeped in sulphuric acid in order to collect moisture. With a little care and trouble next summer in a spot of Southern Europe where *qobar* abounds, meteorologists might soon get an insight into its true nature.

January 3. ANTOINE D'ABBADIE.

SEVERAL communications have appeared in NATURE on the subject of atmospheric haze. It would be interesting to know whether the writers consider the haze which they have described as identical in substance with that which I would call *ordinary* atmospheric haze. The haze of these writers is a haze taking the visible form of layers or bands. The haze to which I refer has under ordinary circumstances no visible form at all. We are conscious of its presence by its effect in diminishing the transparency of the air. Everyone knows that, quite apart from fog, or smoke, or dust, or low cloud, or falling rain, the transparency of the air varies very greatly at different times. In our climate there is nearly always more or less of atmospheric haze, the rare exceptions proving the rule; and the haze may be so dense as to render terrestrial objects invisible at a distance of a very few miles. Celestial objects may also be obscured by the same cause. Not to speak of the varying brightness and varying colour of the sun at sunset (in the production of which effects another cause may co-operate), there are occasions on which the sun long before sunset is shorn of his beams through the intervention of a low general haze, the hygrometric conditions at the time being such as to preclude the idea of fog, to which indeed the haze referred to bears little resemblance.

On July 24, 1868, I witnessed from the summit of Snowdon a curious effect of this diffused haze. The day was cloudless. Overhead the sky was clear and blue, but at lower altitudes it was hazy, and the haze gradually thickened towards the horizon, where it terminated in an opaque brown ring, which encircled the mountain and shut out from view all objects beyond a distance of about 15 miles.

The nature of atmospheric haze has not, I think, hitherto been satisfactorily elucidated, and it is much to be desired that advantage should be taken of some occasion when the haze is exceptionally dense, for the application of the various methods of research which modern science has rendered possible.

Clifton, December 25, 1888. GEORGE F. BURDER.

On the Use of the Words "Mass" and "Inertia"—a Suggestion.

As a teacher of dynamics to Engineer Students, I followed with interest the discussions in NATURE, as to the use of dynamical terms, that have taken place within the last two years, and have recently re-read the whole correspondence with care. Two points seem to me to have been not quite sufficiently brought out.

(1) Physicists and teachers of dynamics, however careful they may desire to be, use the word "mass" in two senses: (1) in the old, non-scientific, (Johnsonian) sense of a "lump of matter," and (2) in the precise scientific sense of the "inertia" of a lump of matter. Indeed, I suppose that no scientific man would hesitate to speak of "the inertia of a mass of matter."

The phrase "attracting mass" is universal among scientific men, when attracting "lump" would do just as well. Thus, in Prof. MacGregor's very carefully written "Kinematics and Dynamics," we find, in Art. 290, "mass" carefully defined (in the sense of inertia) as the value of a certain ratio, and in the next article the use of the word in the sense of quantity of matter is deprecated; yet, in Art. 355, we have "attracting mass" where attracting "inertia" would not do, followed, a few lines further on, by "a particle of unit mass" where "unit inertia" would serve as well.

It is this double use of the word that, I think, sometimes escapes Engineers.

Each of the words "mass" and "weight" is used in two senses, one of which is common to both, but the other not. The fact confirms very strikingly Prof. Greenhill's contention that the scientific man is unwise to attempt to limit for his own purposes the signification of a word already well established in the language. For it shows that he cannot even keep straight himself. I think myself that the scientific man ought to back out with as much grace and celerity as may be, and determine for the future to say "inertia" when he means "inertia," and to use for its numerical representation the symbol "*i*" (or perhaps "*s*"—sluggishness) rather than the symbol "*m*." The symbol "I" might still be used for *moment of inertia*. Such an expression as a "mass of 20 pounds" would still mean exactly what it does at present, and nothing already written would be affected by the change.

(2) The second point that I have to mention is purely a question of procedure in teaching.

The whole subject of dynamics might well be termed the study of the inertia (the "sluggishness") of matter. This is the one new property whose existence, signification, and measurement has to be brought home to the student. Now, I would urge that it does not seem reasonable to ask the student simultaneously to comprehend a new property of matter and to alter his unit of force by defining it with reference to the new property. Do what we will, our students before they begin to learn dynamics will be familiar with the notion of "force" as a "push" or a "pull," and measured in terms of "pounds" and "ounces."

I think it would be far the best plan to define the British unit of force as the weight *in London* of the standard pound lump, and the unit of inertia as that of the mass or lump on which this force generates the unit acceleration of 1 foot-per-second per second.

Thus the unit of inertia would be that of 32·1912 standard pounds, the number 32·1912 being, for brevity, throughout the teaching, written "*g*."

This would be to adopt with careful definition, by which it is rendered perfectly precise, the Engineers' unit of inertia for purposes of instruction in dynamics. It means empoying a *force-time-length* system of units instead of an *inertia-time-length* system.

Such a system would be in harmony with the order of our experiences and of our ideas as we grow in intellectual stature, and with the history of human thought as written in our language, and it is unwise to wage war with our own past even under the encouraging leadership of your correspondent "P. G. T."

Perhaps I may be allowed here to deprecate the somewhat misleading effort now being made by some chemists and physicists to substitute the word "mass" for "weight" where no question of inertia is involved or dreamt of, as, for instance, in the definition of specific heat, by reference to equal masses, instead of equal weights, as if the idea of quantity of matter had not been attained quite independently of the conception of inertia, and were not in the case in question always determined by weighing. A. M. WORTHINGTON.

Royal Naval Engineer College, Devonport,
December 30, 1888.

Eight True Ribs in Man.

IN the number of NATURE which appeared on November 1, 1888, there is a notice to the effect that "at one of the meetings of the Anatomical Society, during the session of the Medical Congress in Washington, Dr. Lamb, of the United States Army Medical Museum, spoke briefly of a singular phenomenon he had observed in his examination of human breast-bones. It was the occurrence, in a number of specimens, of an eighth rib,

the cartilage that is usually found below the seventh rib being fully developed into a rib." This description is somewhat ambiguous, but I presume it refers to the occasional elongation of the eighth costal cartilage in man, and its direct articulation with the sternum. At the time when I read this notice I was organizing a system of "collective investigation" in my class of practical anatomy, in Trinity College, Dublin, and I asked Mr. O. L. Robinson, one of my assistant demonstrators, to undertake the investigation of this point. During the last two months he has examined thirty subjects, and he has found the eighth costal cartilage united to the sternum in no less than five of these. In four subjects (two males and two females) the eighth cartilage of the right side alone showed this condition; in the remaining case (a male) the eighth cartilage on each side reached the breast-bone and articulated with its fellow in front of the upper part of the ziphi-sternum. The anomaly is therefore one of some frequency, seeing that it has been noted by Mr. Robinson in about 17 per cent. of the subjects which he has examined. I may mention that all the specimens are now in my possession.

But my object in making this communication is not so much to record the results obtained by Mr. Robinson, seeing that these will be more fully dealt with elsewhere, as to call attention to a remarkable statement which is made by NATURE on the authority of *Science*. It runs as follows:—"Dr. Lamb has made a thorough search of anatomical literature for references to this peculiarity. In the English books there is only a single incidental reference to it, and in that case the author does not say that he has ever seen a specimen. In German books there are two references, one of them being the one mentioned by the English authority." Certainly this is not my experience of the literature on this subject. There is hardly a German text-book of importance in which the anomaly is not referred to.[1] Thus Gegenbaur, Aeby, Luschka, and Henle, all mention it, and the two last enter into the question at some length. Henle likewise quotes the observations which have been made upon this point by Hyrtl and Prof. Oehl of Pavia. It is true that our own text-books are for the most part silent on the subject, but Prof. Humphry in his classical work on the human skeleton, p. 323, remarks: "In a specimen in the Cambridge Museum, which measures seven inches, there are eight cartilages of ribs separately united to the sternum." This is not the description of a man who has never seen such a specimen.

It is interesting to note that, of the ten cases recorded by Dr. Lamb, nine occurred in Negroes and one in an Indian. Luschka, referring to the assertion that the anomaly is more frequently observed in black races, says: "Im Verlaufe weiterer Nachforschungen hat es sich jedoch herausgestellt, dass bei den Negern nicht häufiger als bei anderen Menschenstämmen und immerhin nur in Ausnahmsfällen acht Rippenpaare an das Brust-bein angeheftet sind" ("Die Anatomie der Brust," 1863, p. 119).

Another feature of interest in connection with this anomaly is centred in the fact that in the lower apes, and also in the chimpanzee, it is the typical condition. As a rule, they present eight true ribs on each side. The orang, however, resembles man in this respect, and normally possesses only seven true ribs. Curiously enough, the transition stage between man and the orang on the one hand, and the chimpanzee on the other, is to be found in the gibbon. In this ape, so far as my experience goes, the cartilage of the eighth rib, although it is long and rests by its tip against the ziphi-sternum, does not articulate with the sternum. A condition similar to this is occasionally seen in man.

D. J. CUNNINGHAM.

Trinity College, Dublin, January 2.

[1] It is not referred to by Krause, Hermann Meyer, or Pansch, but in these books, as in our English text-books, the omission is evidently due to want of space and not to want of knowledge.

"The Cremation of the Dead."

IN your excellent article on the above subject (p. 219), it is stated that a provision contained in the will of a testator directing the cremation of his remains has no legal effect. This is no doubt correct, for, although the law permits a man to dispose of his property by will, it does not permit him to dispose of his own corpse.

This legal difficulty may, however, be surmounted by an indirect method. Most testators bequeath legacies to their executors, and also to their nearest relatives; and the legacies bequeathed to the latter are not unfrequently of considerable value, even when the testator is a man of only moderate means. If, therefore, each of the legacies are made conditional upon the legatee taking, or concurring in taking, the necessary steps to procure the cremation of the testator's remains, the wishes of the latter would in the majority of cases be carried into effect; since any attempt on the part of a legatee to interpose any obstacle would involve the forfeiture of his legacy.

A. B. BASSET.

Conservative Club, S.W., January 6.

"Degradation" of Energy.

IT may perhaps have occurred to others besides myself that the term "degradation"—as applied to the transmutation, for instance, of mechanical energy into heat energy—is a rather stronger one than our present knowledge warrants us in using: that it casts, in fact, an unmerited slur on the character of that eminently respectable concept, energy. We seem hardly justified in supposing that any *intrinsic* deterioration of the energy takes place in such transmutations as the above.

Might not "depreciation" be a rather preferable expression? This would imply nothing more than a lowering in the value of energy in relation to the particular needs and mere agencies of man, and not any absolute change in its character for the worse.

Similarly, money securities are said to be "depreciated" in a particular market, while they may not be at all lessened in absolute value.

H. G. MADAN.

Eton College.

Hares Swimming.

IN *Chatterbox* of May 12, 1879, published by Wells Gardner, Paternoster Buildings, is an account by J. G. Fennell of several instances in which he has seen hares swim across both fresh and salt waters.

OCTS. DEACON.

Loughton, Essex, January 5.

THE RECENT SOLAR ECLIPSE.

WITHIN the next few days we may expect detailed news of the various parties organized to observe the eclipse of January 1. In the meantime, the following telegram from Mr. Pickering, chief of the Harvard Eclipse Expedition, who was at Willow, California, will be read with interest:—

"The sky was clear during the whole of totality. The corona was larger and more irregularly shaped than usual, exhibiting great detail in its filaments. Three of the geometric contacts were observed. The duration of totality was 118 seconds, or three seconds longer than had been predicted.

"Capital drawings were obtained of the whole corona. Eight negatives were obtained with a 13-inch refracting telescope, and six with an 8-inch telescope, and seven photometric observations were made of the corona's light. The drawings show the corona extending outwards from the sun for two of its diameters—that is, 2,000,000 miles in both directions. The corona somewhat resembled that of the eclipse in July 1878."

Another account of the doings of Prof. Pickering's party states as follows:—

"During yesterday's eclipse of the sun twenty-five negatives were taken at Willow, California, to measure the brightness of the corona and its surroundings. Five of these were obtained to search for intra-Mercurial planets, and twenty to study the spectrum of the corona in order to determine its composition. These negatives will reach from the yellow rays to the extreme ultra-violet.

"The general illumination during the period of totality was found to be lighter than during the eclipses of 1878 and 1886. The corona was similar to those of 1868 and 1878, but showed much more detail than the latter, and was exceptionally fine, extending usually on one side to two solar diameters. A striking characteristic was two forked wings of light. The polar rays were well defined and con-

siderably shorter. At Cloverdale, the eclipse was observed with great accuracy, but shortly before totality some cirrus clouds passed over, all tinged with the most brilliant colours of the rainbow.

"Venus appeared during the early stages of the eclipse, while Mercury and the other planets were plainly in view during every phase that was photographed.

"At Willow, the temperature dropped 7°, but the fluctuations of the barometer were quite imperceptible. The velocity of the wind diminished at first, but afterwards increased."

Prof. Todd secured a number of fine photographs of the corona, showing, according to Reuter's telegram, rays extending 10° or 12° from the sun.

At Winnemucca, the United States Signal Service observers made drawings of the streamers of the corona, and also took successful photographs. They saw the edge of the moon projected against the corona for some time after the total phase had passed.

At Lick Observatory, the eclipse was successfully observed, and a number of photographs were taken.

At Norman, California, the fourth contact was observed, but the first was lost in clouds. The moon's limb was not seen projected on the corona either after or before totality, although careful search was made. The telescope was used for making drawings of the corona adjacent to the sun's poles, and the sketches show very complex filaments. The negatives taken are excellent, and show the corona very similar to that seen in 1878. Long streamers were readily traced through 4°.

The party of observation at Bartlett Springs report that the corona was beautifully distinct, and that they saw remarkable changes in the length of the coronal lines. They obtained nine photographs of all contacts, studied the structure of the inner corona, and made measures of light intensity during totality.

Four long streamers were seen proceeding from the prominences, and the chromosphere was strong for a full quadrant distance of the west side of the sun. The northern and southern limbs of the sun showed a great number of fine radiating filaments.

At Chicago, a beautiful view of the corona was obtained. Two long streamers pointed nearly west, and two shorter ones were almost opposite. At the beginning of totality intense red flames burst out on the sun's western side, covering a space of 90°. The inner corona presented a beautiful spectacle in the telescope. Its radiating filamentary structure, with both curved and straight lines, was distinctly seen.

At Healdsburg, although only nineteen-twentieths of the sun's surface were obscured, Venus, Mars, Jupiter, Mercury, and the principal fixed stars were visible. The corona also appeared with long rays of light parallel to the sun's equator.

Mr. Swift, Director of the Warner Observatory, stationed at Nelson, California, reports that, as far as it afforded an opportune search for an intra-Mercurial planet, the eclipse was a failure, owing to clouds and haze.

At Anaheim, no photographs were secured, but it is claimed that an intra-Mercurial planet was seen during the period of greatest obscuration.

At Winnemucca, Nevada, one observer discovered a comet near the sun. No appreciable change of temperature was noticed at this station. Accurate observations were also made of the shadow bands. The corona was similar in general appearance to that of 1878. The streamers extended to a distance of from three to four diameters, and the red protuberances were strongly marked.

At Grass Valley, during the period of totality, the stars and large planets were seen with the naked eye, and the corona and protuberances offered a grand spectacle. The thermometer fell 7° between the moment of first contact and totality. At Virginia City, Nevada Territory, the thermometer fell 10° during the progress of the eclipse.

At Blackfoot, Idaho, all four contacts were observed. A short time before totality the moon's limb was seen projected against the corona. The mercury fell 13°.

From the above accounts it is quite clear that new information touching many important points has been secured. This is most fortunate, for the eclipse occurred at a well-marked minimum of solar spots; indeed, it was as marked as that of 1878, when again the eclipse swept over the American continent and was most fully observed.

There seems no doubt that the expansion of the sun's surroundings in the plane of its equator, dwelt upon strongly by Newcomb in his account of the eclipse of 1878, has been re-observed. We read that this ring was seen to extend some 2,000,000 miles on either side of the sun, and to put on the appearance of two forked wings of light. Not only in 1878 was this ring-like extension well marked, but, in consequence of the extreme quietude of the sun's atmosphere at the time, the exquisite structure of the atmosphere over each pole was one of the most striking features of the eclipse. The appearance was produced by the structure of the coronas bending gracefully over from the sun's axis prolonged, that nearest the pole bending least. This or something very like it has evidently been again seen, and the photographs which have been taken by Mr. Pickering's and other parties will evidently give a good account of them.

It must be noted, too, that the American astronomers have, as might have been expected, used large telescopes. We read of 13-inch and 8 inch refractors. Nothing so large as this has ever been employed before in eclipse expeditions, but then the parties this time have not been far from their base. In one of the telegrams it is stated that Mr. Pickering's party secured twenty spectrum photographs of the corona. This, perhaps, is the best news of all; and we read, too, that the less refrangible end of the spectrum has not been neglected.

Considering the short duration of totality, the results secured reflect the highest credit upon the organizers of the parties and upon the individual observers.

RECENT WORKS ON ALGÆ.[1]

PROF. ASKENASY tells us, in a brief preface, that the Algæ collected during the voyage of the Scientific Expedition in the *Gazelle* were intrusted to him for examination, and that in the work he was assisted by Herr Moebius, by whom the greater part of the excellent figures in the plates were drawn. The remainder of the figures, with the exception of those in Plate I., were drawn by the editor, thus affording an apt illustration of the great advantage to naturalists of acquiring facility in drawing.

In the determination of the Algæ, Dr. Askenasy had the assistance of MM. Bornet and Hariot; the Characeæ and Conjugatæ were described by Dr. Otto Nordstedt, by whom the well-drawn figures in Plate I. were executed. Herr Grunow described the Cystophyllum and Carpophyllum, and the difficult genus of Sargassum.

The only new plant among the Confervaceæ is *Anadyomene reticulata*, Askenasy, from the Island of Dirk Hartog, in West Australia. The Characeæ, now included among Algæ, are rather numerous; among them are two new species of Nitella.

[1] "Forschungsreise S.M.S. *Gazelle*," iv. Theil-Botanik. Algen; mit Unterstützung der Herren E. Bornet, A. Grunow, P. Hariot, M. Moebius, O. Nordstedt. Bearbeitet von Prof. Dr. E. Askenasy. Mit 12 Tafeln. (Berlin: Ernst Siegfried Mittler und Sohn, 1888.)

"Om structuren hos Champia och Lomentaria," med anledning af nyare tydningar. Af J. G. Agardh, Öfversigt af Kongl. Vetenskaps-Akademiens. Förhandlingar, 1888, No. 2. (Stockholm.)

"Fresh-water Algæ collected by Dr. Berggren in New Zealand and Australia." By Otto Nordstedt. With 7 Plates. Communicated to the Royal Swedish Academy of Science, June 1887. (Stockholm, 1888.)

Dr. Askenasy prefaces his description of Halimeda by remarking that the structure of the genus has not been hitherto described. From this it would appear that Dr. Agardh's observations on Halimeda, contained in Part V. of his work, "Til Algernes Systematik" ("On the Classification of Algæ"), is still unknown at Berlin. It may be mentioned that, while the title is in Swedish, the work is in Latin.

The remarks of Dr. Askenasy are, however, not the less welcome, illustrated as they are by the figures in Plate IV. One new species, *H. macrophysa*, is described. It is to be regretted that so little is as yet known of the fructification of these plants.

One new species of Caulerpa, *C. delicatula*, allied to *C. Brownii*, is added to the sixty-seven species of this genus already known to science.

The Ectocarpeæ are carefully worked up, and one new species from Kerguelen's Land, *E. Constantiæ*, has been added by Dr. Hariot.

Perhaps the most interesting part of the work is the result of Dr. Grunow's study of the genus Sargassum. Every algologist is aware how difficult it is to identify the specimens, often very fragmentary, of this plant, which lie before him for examination. Fortunate is the collector who obtains a whole plant of Sargassum, comprising root and lower leaves—which often differ materially from those in the upper part of the plant—branches bearing leaves only, and other branches bearing fruit and vesicles as well as leaves. It is owing to this fragmentary state of the plants that the published descriptions are frequently defective.

Dr. Grunow has done much to elucidate the life-history of the genus Sargassum by his discovery that some species are monœcious, and others diœcious. In describing *S. Carpophyllun* (see "Voyage of the *Novara*," p. 56), Dr. Grunow mentions the occurrence on the same plant of two kinds of fruit—namely, short receptacles which correspond with those described by Dr. Agardh, and also linear receptacles three-quarters of an inch long. He, however, makes, in this work, no further observations on the subject.

In the present work he merely mentions that the plant is monœcious. It will be seen from the descriptions of the other species in the text that Dr. Grunow has been able to prosecute successfully his researches on the fruit of the Sargassa. In most cases it is indicated in the text whether the species are monœcious or diœcious. It seems to be ascertained that the smaller kind of fruit contains spores; while the antheridia are contained in receptacles nearly twice the size of the former. There also exists much diversity in the form of the receptacles belonging to the same species. The spore-bearing receptacles are sometimes forked or spiny, while those bearing antheridia are simple, smooth, and cylindrical. The list of Sargassa in the present work contains twenty-eight species and varieties. In the case of the varieties Dr. Grunow is careful to mention in what respects they differ from the original species.

As to *S. bacciferum*, it is mentioned in the text that its history is still insufficiently known. The editor refers to the pelagic specimens, called "gulf-weed," which float for a time without root or fruit, and subsequently decay; but he does not seem to be aware the *S. bacciferum* was found by Mr. Moseley,[1] during the voyage of the *Challenger*, growing plentifully and full of fruit on rocks in Harrington Sound, Bermudas. The *S. bacciferum*, var. *foliifera*, also bears fruit.

It may be remarked that while there is a general impression that no parasitic Algæ are found growing on gulf-weed, Dr. Askenasy met with a specimen among the Algæ brought home by the *Gazelle* on which were growing a *Rivularia* and a *Calothrix*, and that other epiphytic Algæ were found on the same species by Martens.

Among the Rhodophyceæ of this collection, there is one new genus, *Episporium centroceratis*, Moebius. It is from West Australia, and is classed with the Cryptonemiaceæ. The new species are four in number—namely, *Hildebrandtia Lecannellieri*, Hariot; *Chaukausia Naumanni*, Askenasy; *Rhabdonia decumbens*, Grunow; and *Sarcomenia intermedia*, Grunow. Among the rarer species are *Corynospora Wüllerstorfiana*, Grunow; *Ptilota Eatoni*, Dickie; and *Marchesettia spongioides*, Hauck. A plentiful harvest was obtained of the beautiful and very rare Nitophylla and Delesseriæ of the Southern Ocean.

The attention of algologists will be drawn to the minute and careful analytical descriptions of many species of the Florideæ. Great pains have been bestowed by Dr. Askenasy on the description of some species of Galaxaura: the more delicate parts of these plants, he observes, have not been described. Fruit is rare, and but imperfectly known in this genus. It may be observed that Dr. Askenasy's classification of Galaxaura differs from that of Agardh ("Til Algernes Systematik," Part vii., Florideæ). By the former it is placed among the Chætangiaceæ; the latter retains it among the Helminthocladieæ.

Dr. Askenasy gives an elaborate description of that singular production of Nature, *Marchesettia spongioides*, Hauck. He mentions it as "this plant or organism," for it seems to be between a Sponge and an Alga. It was known imperfectly to Semper and Esper. Dr. Hauck, who had found it among the Sponges in the Museum at Trieste, announced that it was an Alga, which belonged to the Florideæ, and to the group of the Areschougieæ ("Su un nuovo caso di simbiosi," *Atti del Museo Civ. di Stor. Nat. di Trieste*, 1884). In external appearance this "organism" resembles a branched Sponge; the Alga being entirely inclosed within it. Dr. Askenasy has devoted one whole plate (Plate XII.) to illustrate the Marchesettia. The fructification is at the end of the branches. Tetraspores were seen by Dr. Hauck and by Dr. Askenasy, but it is not mentioned whether they were cruciate or zonate. Dr. Agardh observed cystocarps, which he thought approximated to those of Rissoella.

On the inside of the "organism," and among the branches of the Alga, Dr. Askenasy found, in the specimens brought home by the *Gazelle* Expedition, and preserved in spirit, a slimy substance, like that which constitutes the life of a sponge, and he is decidedly of opinion that *Marchesettia spongioides* is, to use his own words, "eine symbiose zwischen einer Floridee und einer Spongie darstellt" (p. 41). Marchesettia is a native of Madagascar, Singapore, the Philippines, and New Caledonia.

The external resemblance of the Marchesettia to a species of Thamnoclonium of the section Dictyophoræ is so great that Dr. Agardh gave to the latter the name of *Th. Marchesettioides*. The plants, when in fructification, may, however, be always easily distinguished, the fruit of the Thamnoclonium being contained in leaflets, which spring from the sides of the plant.

This is a very useful work to algologists; but its utility would have been increased by the addition of an index. It may also be observed that the size of the type might have been enlarged with benefit to the eyes of students.

The subject of Dr. Agardh's essay is the structure of Champia and Lomentaria. He observes that within the space of little more than a year, four special essays—two by N. Wille, one by F. Debray, and another by R. P. Bigelow—have been published with a view to demonstrate the structure of these well-known plants, and that these publications give an entirely erroneous representation of the entire development of these Algæ. He therefore thought it expedient for him, who had published ten years ago a very different description, to state his opinion on

[1] See extract from Mr. Moseley's letter, dated June 27, 1873, in Dr. Dickie's paper on the marine Algæ of St. Thomas and Bermuda, Journal of the Linnean Society, vol. xiv.

these new works and his own views on the subject. This he has done in the present essay.

The descriptions referred to by Dr. Agardh appeared in his work entitled, "Florideernes-Morphologi" (published in the Transactions of the Royal Swedish Academy in 1879); but as this work was written in Swedish, it has probably not met with so many readers as it deserves. With a view to make this work more accessible, Dr. Agardh issued, in 1880, a Latin translation of it.

After stating the views of the essayists, and commenting on them, he quotes the concluding words of Mr. Bigelow, the most recent of them: "We have to leave our subject for the present in an unsettled and therefore rather unsatisfactory condition."

Dr. Agardh then quotes from his Swedish work the description of the structure of Lomentaria and Champia, showing that in the young state the interior is never hollow, but is interlaced with delicate coloured filaments, which disappear in the older parts of the plants. He also mentions that some Florideæ, which are apparently hollow, such as Chrysymenia, Dumontia, &c., are in part filled with a gaseous fluid, which probably assists such plants as have thin walls in preserving an erect position.

Dr. Otto Nordstedt is already well known to British algologists by the specimens of fresh-water Algæ which he has issued in conjunction with Prof. Wittrock, of Stockholm. The work he now sends us proves that he is a good draftsman and linguist, as well as algologist. It is on the fresh-water Algæ of New Zealand, and is written in very good English, and carefully got up in every respect. The author mentions that the Desmids have received his greatest attention, and that comparatively little attention has been bestowed on the Phycochromaceæ; a few only have been taken from brackish water.

Dr. Nordstedt mentions that he has not met with any new genus of fresh-water Algæ, or with any genus not represented in Europe, with the exception of *Phymatodocis*, which, he tells us, occurs also in North and South America, and in Australia.

With regard to the localities in New Zealand where fresh-water Algæ are found, no one is better acquainted with them than Dr. Berggren, who had made an interesting collection, subsequently examined by Dr. Nordstedt, and included in the present work on these plants. Dr. Berggren's remarks, as recorded by Dr. Nordstedt, will be read with interest. He says:—

"The fresh-water Algæ in New Zealand do not, from several causes, occur so frequently as in the regions of the corresponding latitudes of the northern hemisphere. The ground, which is generally sloping, gives a rapid course to rivers and brooks, and the surface occupied by stagnant water, swamps, and bogs is not very extensive. The comparatively small number of water- and bog-plants growing sociably together (such as *Potamogeton* and others), which in the stagnant waters and marshy spots of Europe are favourable to the existence of the fresh-water Algæ, is of great consequence. The usually dry summer generally causes the draining of those lowland spots, which in the wet season (the winter) are swamps. Therefore the Algæ are more frequent in the damp and moss-grown localities of the mountainous regions in the Northern as well as in the Southern Island. In the rivulets from hot springs in the hot lake district in the Northern Island, the Algæ are especially Phycochromaceæ, but likewise Confervaceæ and Zygnemaceæ, to be found growing in great abundance."

Dr. Nordstedt mentions that from his examination of Dr. Berggren's collection, it appears that the swampy ground on the Canterbury Alps and the highlands round the Taupo Lake are the best localities, especially for Desmids.

The description of the New Zealand Algæ is supplemented by lists of a few fresh-water Algæ from Australia and the Hawaiian Islands. Then follow a list of the principal works consulted, and an index. The work is illustrated by seven plates, the figures of which are all drawn—and well drawn—by the author.

MARY P. MERRIFIELD.

THE JOURNAL OF MORPHOLOGY.[1]

THE year 1887 marked an epoch in the advance of natural science in America, as that in which the above-named journal made its appearance. The first number was not published until some months after the advertised time, but, once in circulation, it became clear to all that the delay was warranted by the eminently satisfactory result obtained. The journal was defined in the preliminary advertisement as one "devoted principally to embryological, anatomical, and histological subjects," it being stated that "only original articles, which deal thoroughly with the subject in hand, will be admitted to its pages." The three parts before us present in the aggregate 593 pages crown octavo, with thirty plates, and woodcuts interspersed with the text. Seventeen papers have in all appeared, and of these, seven or eight are devoted to embryology, with a total of 361 pages, and four or five to anatomy and histology, with that of 182 pages. One is purely experimental, and deals with the mental powers of spiders (37 pages), and another is largely palæontological (12 pages), while the three which remain (61 pages in all) are largely controversial. The illustrations are throughout most excellent, but it is surprising to what an extent the work in this department has been done in Germany, especially as it has resulted in "a great loss of time and inconvenience in supervision." We are assured, however, that "there is no remedy except in the employment of an expert lithographer, to work under our immediate direction." We sincerely hope the editors may soon see their way to the employment of such an one, for surely he is to be found in the United States.

It will be seen from the foregoing that while, in the early issues, all branches of animal biology have been represented, there is a marked preponderance of embryological literature; and, taking into account the share which the discursive papers contribute towards this subject, there would appear to be a predisposition in favour of the same. The study of embryology is one which lends itself, by virtue of its constitution, to the production of hypotheses and broad generalizations; and, in knowledge of the extent to which previous workers have often availed themselves of this, we are led to inquire how far the predisposition in question may be due to this cause. Certain of our American brethren are notorious for their power of accumulating superfluous detail. Publications could be cited in which the "padding" is inversely proportionate to the actual work done, and we would fain desire that the authors should work more and write less; indeed, the senior editor has acknowledged this. He writes: "Concentration is our need"; and further, "The inaccessibility of our literature—scattered as it is among the publications of so many societies and institutions, and mixed up with a mass of heterogeneous matter that has no value for a zoologist—is notorious." All this being so, it is not surprising that the editors have decided to issue the numbers only "as often as the requisite material is furnished."

In estimating the usefulness of a private journal such as this, especially when so largely devoted to the interests of a subject lending itself to broad generalization, we cannot refrain from deploring the tendency, elsewhere manifest, towards the introduction of a bias in favour of

[1] *The Journal of Morphology*, edited by C. O. Whitman, with the co-operation of E. P. Allis, Jun. (Boston: Ginn and Co.)

certain restricted lines of thought. We meet with indications of cliquism and faction, and it would not be difficult to show that, in respect to this and some other matters, such journals at times compare unfavourably with that of the Society, which is kept in check by freedom of discussion and by criticism at the hands of referees. Instances are not wanting to show that the elementary student, starting research, is at times turned adrift in the labyrinths of a highly-involved problem, before he knows with what he is dealing; and if, as has occasionally happened, he be working under the influence of a preconceived bias, mischievous results must accrue. Although, in the pages before us, no such instance as this is actually forthcoming, we are of opinion that, in respect to certain matters referred to below, consultation with specialists prior to publication, would have resulted in the withdrawal of heresies which constitute the only jarring element in this beautiful work.

The authors of the papers thus far published are, for the most part, men of established repute. For many of them we entertain a personal regard, and there are among their leading productions monographs that are continuations of those with which, under the old *régime*, they have honoured our national journals. Others there are with the preliminaries to which we claim a proud familiarity, and many of us look back with pleasure upon the fact that one of the original communications on the subject of the opening paper was made in our midst (cf. P.Z.S., 1886, p. 343). The journal makes its *début* under auspicious circumstances, and the above and other similar considerations show it to be the outcome of a growing want, in the unfolding of which we have ourselves had a stake; it is manifestly our duty, therefore, to support it.

The papers, when considered individually, must be declared of excellent merit, and, detailed criticism being here impossible, we pass to a brief comment upon those most conspicuous or most likely to raise discussion. Chief among all are the contributions of the senior editor. We defer mention of the more philosophic of these till the end of our notice; his "Contribution to the History of the Germ-Layers in Clepsine" (78 pages) is a marvellously-wrought piece of work; and, if his leading deductions concerning the fate of his "macromeres" be capable of support, he may well lay claim to a masterly stroke in advance. With his "teloblasts" there is initiated an entirely new line of inquiry, in itself refreshing after the ceaseless quibbles as to the fate of the "blastopore," while it gives promise of a direct and important bearing upon some of the most revolutionary of recent embryological discoveries (*e.g.* that concerning the part played by the ectoblast in the development of the excretory system). The author marshals his facts in faultless sequence: his monograph is a model of its kind, the more contemplated the more to be admired; and it fully establishes his reputation as a leader among American embryologists.

Four of the papers offered us pertain to the eye, with a total of 171 pages. The authors of these are Messrs. Patten and Kingsley, and the first of the series, by the former, is a condensation of his larger contribution to the Naples *Mittheilungen*. This paper has obtained a notoriety on account of the heated discussion which it evoked, and, setting personalities aside, we admit that the author's ill-conceived "dynamophagous organs" received, together with his more flagrant heresies, a well-deserved refutation. Many of this investigator's suggestions and aspirations are neither better nor worse than those of his critics and predecessors; he has, like many more enthusiasts, aimed at high game with a resolve to be sensational at all hazards. It must be admitted, however, on careful perusal of his work, that he erred in an over-enthusiasm, and that there underlies his remarkable production a substratum of solid fact. Excessive theorizers, like excessive controversialists, stand in a fair way of being shelved, if only by virtue of their verboseness. On examination of the later contributions of this author, we observe that he has profited by his hard-earned experience, and that he has, under the influence of his able editor, chosen the wise, though very obvious, path. The other writer on this subject produces a paper of an altogether more modest cast. In his 16 pages there are embodied a series of very useful observations and suggestions which, if ultimately accepted, will simplify our conceptions of the complex visual organ in the Arthropods. He differs from his contemporary on points of primary importance. We welcome this as a healthy sign (cf. *ante*), and the reader will find that in these papers, and others proffered in this journal, differences of opinion are asserted in inoffensive language, in a spirit as free of both animus and bias as it is becoming the dignity of the subject in hand.

Prof. Osborne contributes two most interesting papers: one, on the internal structure of the Amphibian brain, is the completion of a series of beautiful studies, largely inspired by our greatest living master (cf. *Morph. Jahrb.*, vol. xii. p. 247); the other, on the fœtal membranes of the Marsupials, is also a continuation of earlier studies, and we watch the growth of them with intense interest, in view of those so long looked for at the hands of a countryman of our own, upon the same in the Australian forms.

One of the most ambitious communications is that bearing the title, "On the Phylogenetic Arrangement of the Sauropsida." The author has elsewhere expressed many of his views on the subject; his enthusiasm and daring admitted, we cannot pass unnoticed the superficiality of his essay; in respect to this, it does not even come within the conditions imposed by the founders of the journal. More than that, however. Reference is made by the author to his order *Proganosauria*; if his primary diagnosis of the same (*Zoolog. Anzeiger*, 1886, p. 189) be compared with the original drawing (Proc. Amer. Phil. Soc., vol. xxiii. No. 121) and with the replicas in our national collection, it will be found that the existence of his leading structural peculiarity (we refer to the presence of five distinct tarsalia) is at least doubtful. Even if it did exist, the exaltation of such a character to a position of ordinal value would be unwarrantable, and, as employed by the author, meaningless, inasmuch as a fifth tarsale is present in the Chelonia. This he admits (cf. *Zoolog. Anzeiger*, 1888, p. 597), and in doing so he lands himself in a contradiction. We cannot but regret the hasty introduction of generalizations so sweeping into papers of a provisional nature, and we take this opportunity of entering a protest against this abuse of the "*vorläufige Mittheilung*": as a means of establishing a claim of priority in the discovery of a sound fact it is of the utmost utility, but as converted into a medium for contradiction it becomes intolerable. The over-cultivation of this unfortunate habit bids fair to involve its devotees in difficulties irrecoverable; the best work always has been, and always will be, done, as wrote Goethe, "*ohne Hast, ohne Rast.*" The waste which accrues from the abuse here deplored will ultimately find its own level, but its accumulation is none the less to be regretted.

In matters of *technique* this journal is not deficient. Its general "get-up" is most admirable, and full attention has been paid to minute detail: the type is excellent. The plates are faultless, and admirably arranged in relation to their accompanying explanations, and the eye is never offended by the unpardonable intrusion of a woodcut upon the margin of the page. One or two minor modifications might be suggested, but they are so trivial that we prefer not to burden this notice with them. We observe, with extreme satisfaction, that in leading papers care has been taken to discriminate between the more important representations of fact and the less important diagrams, the latter being interspersed among the text, in woodcut. The

journal will stand the test of comparison with any of its contemporaries, and the immediate promise of a series of papers on the anatomy and embryology of Amia augurs well for its future.

Prof. Cope contributes a very characteristic paper on the tritubercular molar, the leading deduction of which is most interesting and suggestive; it reads (vol. ii. p. 21): "The tritubercular molars of man constitute a reversion to the dentition of the Lemuridæ of the Eocene period of the family of Anaptomorphidæ," and "this reversion is principally seen among the Esquimaux, and the Slavic, French, and American branches of the European race." The senior editor, discussing, in the most philosophic paper of the series, "The Seat of Formative and Regenerative Energy," writes as follows: "These higher (biological) units combine both atomic and molecular structure, but they have, superadded to and including this, a structure as a whole, which is entirely ignored in the expression, 'molecular aggregates.' As they result from the union, not of simple or complex molecules, but of complex molecular groups, their structure may be said to be at least as widely separated from the molecule as this is from the atom"; and, further, "in claiming that 'physiological units' have something higher than molecular structure and power, I am not treading on ultra-scientific ground, but following the course already sanctioned by chemistry and physics, and the only one which can ever reconcile physico-chemical and biological conceptions." We heartily recommend this valuable essay to our readers, for the author's contentions in defence of his belief that "the organism as a whole controls the formative processes going on in each part," are worthy of all the consideration that can be given them. He appears to us to underestimate the importance of recent advance in organic chemistry. The work of unravelling the constitution of the more complex organic bodies—a work in which certain of our own countrymen are playing a leading part—gives us hope beyond that which he entertains. The presence of the above-cited remarkable passages is, in itself, sufficient to invest the early numbers of this journal with a lasting interest.

We congratulate the editors upon their enterprise; they are supported by influential friends and surrounded by enthusiastic investigators; they have, in turn, fulfilled, thus far, the highest expectations of their most sincere well-wishers, and merited the confidence and support of the biological brotherhood throughout the world.

G. B. H.

THE BALD-HEADED CHIMPANZEE.

THERE is no longer any room for doubt amongst naturalists as to the complete distinctness of the larger anthropoid ape of tropical Africa, the gorilla, from its smaller brother, the chimpanzee. The differences are amply sufficient for specific, if not for generic, distinction. But, on the question whether there is only one chimpanzee, spread over a great extent of the African continent, or several species confounded under the same name, there is still much difference of opinion. As long ago as 1853, M. Duvernoy communicated to the Academy of Sciences of Paris a short description of a second species of chimpanzee (see *Comptes rendus*, vol. xxxvi. p. 927), based on specimens obtained by Dr. Franquet in Gaboon in 1851. M. Duvernoy subsequently published an elaborate memoir on the same subject in the *Archives du Muséum* (vol. viii. p 1). The distinctions insisted upon by Duvernoy between his *Troglodytes tschego* and the ordinary *T. niger* were chiefly osteological; at the same time he characterized the *tschego* (from M. Franquet's description) as having the "face black, and the ears small," while, according to the same authority, the ordinary chimpanzee has "very large ears, and its face flesh-coloured."

In 1858, in a memoir also published in the *Archives du Muséum* (vol. x. p. 94), on the specimens of anthropoid apes in the Paris collection, M. Isidore Geoffroy St. Hilaire published a letter from Dr. Franquet in which the latter again insisted on the differences of the three species of anthropoid apes observed by him in the district of Gaboon. These were characterized as follows:—

(1) The *Chimpanzee*, with the face flesh-coloured, the ears red and large, and the fur black.

(2) The *Gorilla*, with the face black, the ears small and black, and the fur of a brownish chestnut, but varying in tint in different parts of the body, and with always a row of reddish hair starting from the middle of the forehead and following the line of the sagittal suture.

(3) The *N'tchego*, with the face black and the ears small, as in the gorilla. The hairs of this ape, he says, are shorter and darker in colour, and it never attains the size of the gorilla, or carries the red crest across the forehead.

In 1860, the well-known traveller Mr. P. B. Du Chaillu gave his account of the anthropoid apes of the Gaboon to the Boston Society of Natural History (see Proceedings of that Society, vol. vii. p. 296). Mr. Du Chaillu described, as a new species of chimpanzee, *Troglodytes calvus*, "with the head entirely bald to the level of the middle of the ears behind," and "having large ears," while he identified the *N'tchego* of Dr. Franquet as being nothing but the adult chimpanzee (*T. niger*). In a second communication to the same Society (*op. cit.* p. 358), he described another new species of chimpanzee, with a black face, but the forehead not bald, which he called *Troglodytes kooloo-kamba*, from its peculiar cry.

In 1861, the late Dr. J. E. Gray examined Mr. Du Chaillu's specimens of apes, and came to the conclusion that both his supposed new species were only varieties of the common chimpanzee (see P.Z.S., 1861, p. 273). Such also, as was stated by Dr. Gray, was my own opinion at that time, and I have remained in a doubtful state of mind on the subject until a recent period. But the acquisition of the fine female specimen of chimpanzee, generally known by the name of "Sally," by the Zoological Society in 1883, caused me to change my views very materially. There can be no doubt that this animal, when compared with specimens of the ordinary chimpanzee, presents very essential points of distinction. The uniform black face and nearly naked forehead, which is only covered with very short black hairs, together with the large size of the ears, render "Sally" conspicuously different from the many specimens of the common chimpanzee (at least thirty in number) that the Society has previously received. I was at first inclined to believe that "Sally" might be referable to the *Troglodytes tschego* of Duvernoy. But nothing is said, in M. Duvernoy's description, of the bald forehead; and the small ears attributed to the *N'tchego*, are directly contrary to this hypothesis, as in "Sally" these organs are exceedingly large and prominent. On the whole, I was inclined to believe that "Sally" might belong to the *Troglodytes calvus* of Du Chaillu, and she was accordingly entered in the Register of the Society's Menagerie as the Bald-headed Chimpanzee (*Anthropopithecus calvus*[1]), which is certainly a very appropriate name, even if it be not technically correct.

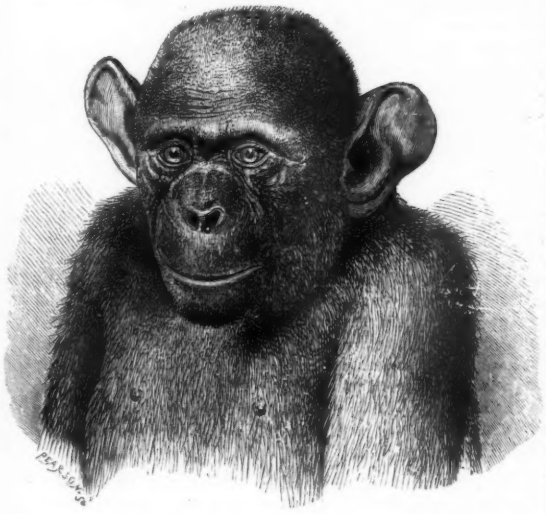
In the beginning of the present month we purchased of Mr. Cross, of Liverpool (from whom we had also obtained "Sally"), a second specimen of the Bald-headed Chimpanzee, likewise a female, which, although much smaller in size, closely resembles "Sally" in every other respect.

Fortunately, there is now in the Gardens a young specimen of the Common Chimpanzee (*Anthropopithecus troglodytes*), presented to the Society in May last by

[1] The term *Troglodytes* being more properly used for a genus of birds, it becomes necessary to employ for the chimpanzees the generic term "*Anthropopithecus*," of Blainville, as suggested by Peters in 1876.

Mr. F. J. Aldridge, F.Z.S., by whom it was brought from Sierra Leone. This specimen is of about the same size and age as the young Bald-headed Chimpanzee, and enables an easy comparison to be made between the two species. Looking first at *A. calvus*, we find the skin of the head, face, ears, and limbs of a dark brownish clay colour, which will, no doubt, get blacker as the animal becomes adult. The ears are perfectly naked, and of large size, and stand out at nearly right angles from the head. The top of the head is very scantily covered with short blackish hair. The whole of the body and limbs are also very thinly covered with hair, especially the abdomen.

When we turn to the young specimen of *A. troglodytes*, we find the upper part of the face and the brows of a dirty flesh colour. Between the eyes, above the nostrils, and passing down the cheeks, it is black. The nose and muzzle are of a dirty flesh colour. The chin and upper lip are covered with longish white hair. The inside of the ears is nearly black. The forehead, cheeks, and the whole of the body are covered with long, harsh, black hair. The colour of the hands and feet are of a brownish clay colour, much the same as those of *A. calvus*.



The rump above and below the anus is covered with longish white hair.

With regard to the size of these two animals, the length of limbs, and other measurements, they are nearly equal. It is probable that *A. troglodytes* is a trifle older than the new specimen of *A. calvus*.

It may be of interest to mention that, as Mr. Bartlett informs me, the young *A. calvus* will kill and eat sparrows in the same manner as "Sally" kills and eats pigeons, whereas the common chimpanzee will not touch any food of this kind.

It must be admitted, however, that the specific term *calvus*, applied to "Sally" and her "younger sister," can only be considered as provisional. When these specimens die, which, we trust, will not be till some distant period, they must be compared with the example of the *Troglodytes calvus* of Du Chaillu, which is now in the British Museum. On the same occasion the skulls of these specimens can be compared with the descriptions and figures given by Duvernoy of his *Troglodytes tschego*. Until this can be done, it is impossible to say decisively whether these two specimens belong to one of the supposed species already described, or should receive a new name.

Finally, I may add that the Ape House in the Society's Gardens, besides these two chimpanzees, contains at the present time a young female Orang (*Simia satyrus*), received on deposit, and a specimen of the Silvery Gibbon (*Hylobates leuciscus*), lately presented by Captain D. L. Delacherois; so that all the three known genera of anthropoid apes may be now seen represented by living specimens. P. L. S.

NOTES.

A MOVEMENT has been started in Norway for the despatch in the summer of 1890 of an Expedition which would try to reach the North Pole, and it is proposed that the leadership shall be offered to Dr. Nansen. Those who are arranging the plans maintain that no other country could furnish such a crew of experienced and hardy ice-men and Arctic travellers as Norway, and that a winter or two in the Arctic regions would affect these men very little. The intention is that an attempt shall be made to reach the Pole by way of Franz Josef's Land, a route advocated by the most experienced Norwegian Arctic travellers as well as by several well-known men of science who have studied the problem. *Ski*, which have played such a prominent part in the Nordenskiöld and Nansen Greenland expeditions, would no doubt again be of great service.

THE Royal Academy of Sciences of Turin, in accordance with the last will and testament of Dr. Cesare Alessandro Bressa, and in conformity with the programme published on December 7, 1876, announces that the term for competition for scientific works and discoveries made in the years 1885–88, to which only Italian authors and inventors were entitled, was closed on December 31, 1888. The Academy now gives notice that from January 1, 1887, the new term for competition for the seventh Bressa Prize has begun, to which, according to the testator's will, scientific men and inventors of all nations will be admitted. A prize will therefore be given to the scientific author or inventor, whatever be his nationality, who during the years 1887–90, according to the judgment of the Royal Academy of Sciences of Turin, shall have made the most important and useful discovery, or published the most valuable work on any of the following subjects—physical and experimental science, natural history, mathematics, chemistry, physiology, pathology, geology, history, geography, and statistics. The term will be closed at the end of December 1890. The value of the prize amounts to 12,000 Italian lire. The prize will in no case be given to any of the national members of the Academy of Turin, resident or non-resident.

THE Board of Electors to the Linacre Professorship of Human and Comparative Anatomy at Oxford have, on account of Prof. Moseley's continued illness, nominated Mr. W. Hatchett Jackson, M.A., F.L.S., to serve as Deputy Professor.

SIR HENRY ROSCOE has been elected to represent the Royal Society on the governing body of Eton College.

WE regret to announce the death of Mrs. Merrifield, whose name as a writer on Algæ and kindred subjects is well known to our readers. She died on January 4, in her eighty-fifth year. To-day we print an article by Mrs. Merrifield on some recent works on Algæ. We learn that she was very ill when this article was written, but it was not thought that the end was so near.

THE annual general meeting of the Royal Meteorological Society will be held at 25 Great George Street, Westminster, on Wednesday, the 16th instant, at 7.15 p.m., when the report of the Council will be read, the election of officers and Council for the ensuing year will take place, and the President (Dr. W. Marcet, F.R.S., will deliver an address on "Fogs," which will be illustrated by a number of lantern slides.

In the January number of the *Kew Bulletin* there is a most interesting paper on the coca-plant, to which considerable attention has lately been devoted, mainly because of the valuable properties ascribed to one of its alkaloids, called cocaine, as a local anæsthetic. It appears that since the discovery of the anæsthetic properties of cocaine the demand for coca-leaves in South America has considerably increased for export purposes. A distinct loss in the alkaloids generally, as well as in cocaine, has been noticed during the transit of leaves to this country; and latterly, in consequence, it has become the practice to extract the alkaloids from the leaves in South America, and export to the United States and Europe a crude preparation, which is largely taken up by manufacturers of cocaine. The demand for coca-leaves has, therefore, fallen off, and the writer of the paper thinks that the cultivation of the coca-plant in our tropical colonies will probably never assume large proportions. South America, he says, is able without further extension of cultivation to produce such enormous quantities of coca-leaves that the one-eightieth part would be sufficient to swamp the cocaine markets of the whole world. The other subjects dealt with in this number are beetles destructive to rice-crops in Burmah, fibre from Lagos, yam bean, Schweinfurth's method for preserving plants, a starch-yielding bromeliad, and the fruits of Mysore.

The Swedish Superintendent of Fisheries, Dr. F. Trybom, has, at the instance of the Swedish Government, been engaged during the past autumn in making a series of scientific experiments on the coast of Sweden for the purpose of studying the condition of the herring when undisturbed. He brought back with him newly-hatched herring-fry and herring-spawn ready to be hatched. The bottom on which these were found consisted of stones, gravel, and shells; the depth of water was about 20 metres, and the temperature of water at the bottom about 11° C. The results of these experiments are not yet known, but a Swedish paper says that they are such as to encourage the Government to permit Dr. Trybom to continue next autumn his inquiries into the development, habits, and habitats of the most important fish on the Swedish coasts.

Dr. Kolthoff, the well-known Swedish naturalist, is arranging an interesting zoological museum at the Upsala University, being a complete representation of the fauna of Scandinavia, with nests, representations of lairs, &c. This is the only museum of the kind in Sweden.

Gaseous fluoride of methyl has been obtained in the pure state, and its density determined, by MM. Moissan and Meslans. The existence of this gas was announced some years ago by MM. Dumas and Peligot, who describe a mode of preparation by the action of methyl sulphuric acid upon fluoride of potassium. The gas obtained, however, by this method is now shown to be a mixture of oxide and fluoride of methyl, and a new method has been developed by means of which it is obtained sufficiently pure for accurate analysis. The reaction is analogous to the one recently described for the preparation of ethyl fluoride, methyl iodide being allowed to act upon fluoride of silver. A regular evolution of gas commences at once in the cold, and the gaseous mixture, consisting of methyl fluoride and vapour of methyl iodide, is led first through a spiral leaden condenser cooled to − 50° C., where most of the latter substance is condensed, and afterwards through a couple of glass tubes heated to 90° and filled with fresh fluoride of silver, which removes the last traces of methyl iodide. This reaction is found to be the only one yet known which gives the gas in anything like a state of purity. MM. Moissan and Meslans have, however, also obtained it in a lesser degree of purity by the action of pentafluoride of phosphorus upon methyl alcohol. The fluoride of methyl obtained as above possesses a normal density corresponding to the formula CH_3F. It liquefies at ordinary temperatures when submitted to a pressure of thirty-two atmospheres in Cailletet's apparatus. It is slightly soluble in water, 100 c.c. at 18° dissolving about 193 c.c. of the gas; it dissolves very much more readily in methyl iodide or methyl alcohol. Perhaps the most interesting fact about it is its great stability, for, even on heating in sealed tubes at 120° in presence of water or a dilute solution of potash, it saponifies only with great difficulty.

Besides the above-described fluoride of methyl, another entirely new one, isobutyl fluoride, C_4H_9F, has been prepared by acting in a similar manner upon silver fluoride with isobutyl iodide. One scarcely knows whether to describe this new fluoride as a gas or a liquid. As a matter of fact, at this time of the year it is a colourless and very mobile liquid, but in summer weather would be a gas, inasmuch as its boiling-point is just about the temperature of an ordinary room, 16° C. The reaction between isobutyl iodide and silver fluoride commences vigorously in the cold, but the mixture requires warming to 50° in order to obtain a theoretical yield. In the form of a gas it burns on ignition, with deposition of carbon and formation of clouds of hydrofluoric acid. The liquid, when pure, is singularly incapable of attacking glass. It is interesting that M. Moissan has now succeeded in preparing, by means of the silver fluoride reaction with the iodides of the corresponding organic radicals, the fluorides of methyl, ethyl, propyl, and butyl, finding them in each case remarkably more stable than the analogous chlorine compounds.

In the latest volume of the American Consular Reports it is stated that Switzerland has followed other civilized countries in adopting a law for the protection of inventions. This law cannot have effect until it has been decided whether 30,000 voters will petition against it, in which case it must be submitted to the people. The American Consul states that it contains several new and interesting provisions, and he gives, in his Report, the text of the law. It is remarkable that only material objects, and not processes, are protected. This peculiarity is said to be due to the efforts of manufacturers of aniline colours and chemicals, who would be injuriously affected by a law which would protect arts as well as tools and machines. The duration of a patent is to be fifteen years; a fixed fee of 20 francs must be paid for the first year, and a progressive annual fee, which amounts in the fifteenth year to 160 francs.

A severe shock of earthquake, accompanied by loud subterranean noises, occurred on December 26 at a part of the Vogtland; it was also felt at Röttis, Lengenfeld, Plauen, and Auerbach. Shocks also occurred at Messina, Jagonegro, and Castroreale on the same day, but no serious damage was done.

The anomalies of weather felt in October and November last in Western Europe were also felt in Russia and Central Asia. From October 27 to November 13, at several places in Northern, Eastern, and Southern Russia, the daily averages were below the normal temperatures of the same days by no less than from 16° to 19° C. On October 28, it was freezing at Tashkent early in the morning. Most Russian rivers were covered with ice from seven to twenty-five days earlier than they have been frozen on the average for a long series of years. Two great waves of cold could be distinguished, both spreading from the north-west to the south-east. In the second part of November there was a sudden return of warm weather, and the Russian rivers were opened again. Throughout this disturbed period the barometer gave valuable indications as to the movements of the cyclones and anticyclones. The centre of the latter moved as follows: on November 5, it was at Pinsk (782 mm. of barometric pressure, reduced to the sea-level); next day it was at Kherson (782 mm.); on November 5, at Pyatigorsk (781 mm.); and next day, at Erivan in Armenia (779 mm.) The height

reached by the barometer at Pyatigorsk was greater than it had ever before been known to be. As to the low pressures of the air, which soon followed the high pressures, they were not less remarkable. Thus, a pressure as low as 723 mm. was measured at Christiansund on November 19; 716 mm. at Nikolaistad (Wasa), and 720 mm. at Kuopio, on November 20; and 721 mm. at Povyenets, in Olonets, on November 21. So low a pressure as 716 mm. (reduced to the sea-level) is of exceedingly rare occurrence. The next minimum of pressure came on November 25, and it was accompanied by frightful storms which blew over Central Russia. The barometer did not fall so low as during the preceding days, but the displacement of the minimum was characterized by a further decrease of pressure in proportion as the centre of the depression advanced towards Central Russia. Like cases were observed also in 1881 and 1886, but they are rare on the whole. On November 25, the barometer at Moscow was as low as 723·8 mm.

AT the meeting of the French Meteorological Society, on December 4 last, the President stated that the Minister of Commerce and Industry had appointed a Committee of Organization for the proposed Meteorological Congress to be held in 1889. The Committee met on November 24, and elected M. Renou as President, and M. L. Teisserenc de Bort as General Secretary. M. Moureau, Secretary of the Society, presented the results of magnetic observations made by him in the western basin of the Mediterranean by direction of the Minister of Public Instruction. M. Renou presented a Report by M. Cœurdevache on the relations of temperature and wind direction at Clermont and the summit of the Puys-de-Dôme during winter. He pointed out that the isotherms at the summit of the mountain are not parallel to those in the plain, the latter being influenced by various agencies, such as sea or mountain. M. L. de Bort stated that it was proposed to hold a meeting of meteorologists at Hamburg, with the view of preparing the basis of an understanding as to the classification of clouds. He thought that "nimbus" and "cumulus," especially, were a source of confusion in cloud observations, and that the height of clouds was much exaggerated in rainy weather. It had been observed that the Eiffel Tower, which now reaches over 670 feet, was frequently enveloped in cloud at a height of about 520 feet. M. Lemoine made some remarks upon the bad effect of the low summer temperatures upon the grape harvest, the first frosts occurring in many cases before the grapes had reached maturity.

THE volume of *Abhandlungen und Berichte des K. Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden* (Friedländer and Son, Berlin)—in which there is a German translation of Mrs. Nuttall's article on a relic of ancient Mexico (referred to in another column)—contains, in addition to this translation, some interesting and valuable papers. It opens with a full account, by Dr. A. B. Meyer, the editor, of certain new arrangements for the better protection and display of objects in the Zoological and Anthropological Museum of Dresden. The editor also gives a list of the Reptilia and Batrachia collected by him in the East Indian Archipelago in the years 1870-73. There are papers on mammals from the East Indian Archipelago, by Dr. B. Hoffmann; on the Indian-Australian Myriopoda, by Dr. Erich Haase; and on other subjects. The volume is carefully illustrated.

PROF. R. MELDOLA, F.R.S., has in the press a work on "The Chemistry of Photography," which will shortly be issued by Messrs. Macmillan and Co., as one of the volumes of "Nature Series." The work consists of a course of lectures delivered last year at the Finsbury Technical College. The chief object kept in view by the author is the necessity for the full recognition of photographic chemistry as a branch of applied science in technical Colleges. Each lecture is followed by an appendix containing hints for the experimental illustration of the subject by means of lecture demonstrations, many of which are new, and all of which have been revised with a view of enabling lecturers to demonstrate the chemical principles of photography before an audience in a simple manner. The mode of treatment adopted will, it is anticipated, be found of use also to practical photographers, by enabling them to obtain a concise and comprehensive view of the scientific principles of their art.

MESSRS. CROSBY LOCKWOOD AND SON have issued a waistcoat-pocket book abounding in tables and concise information on a variety of topics connected with rural affairs, revised by Prof. Fream, of Downton Agricultural College. The title is "Tables, Memoranda, and Calculated Results for Farmers, Graziers, Agricultural Students, Surveyors, Land Agents, Auctioneers, &c.," by Sidney Francis. The contents are trustworthy and useful, and are readily found by means of a detailed index. It would be difficult to enumerate even the principal subjects dealt with in this cubic inch of printed matter; but we may say that, whether the inquirer opens it in order to find the composition of foods, fertilizers, or crops; the rules of measurement for animals, hay-stacks, timber, or water-courses; the strengths of materials; the advantages of water, steam, or horse power; the value of tillages, of tithes, or of woodlands; particulars as to piece-work, or costs of embanking, excavating, &c.,—he will find statistics on all these, and countless other subjects.

MESSRS. CROSBY LOCKWOOD AND SON have published a second edition of "The Blowpipe in Chemistry, Mineralogy, and Geology," by Lieut.-Colonel W. A. Ross, R.A. In this edition the work has been revised and enlarged. It contains 120 illustrations by the author.

WE have received "The Mining Manual for 1888," compiled by Mr. Walter R. Skinner. The object of this work is to give the fullest possible information with regard to mining companies. The compiler mentions that, without reckoning South African mines, he has referred to 900 companies. Owing to the growing importance of mining at the Cape, Natal, and the Transvaal, a separate section on South African mines has been added.

IN "The Floral King; a Life of Linnæus" (W. H. Allen and Co.), Mr. Albert Albery has presented a very good sketch of the career of the great Swedish botanist. It includes a number of interesting extracts from the late Dr. Ährling's selection from the correspondence of Linnæus.

MR. JOHN MURRAY has issued an interesting little book on "The Invisible Powers of Nature," by E. M. Caillard. Its object is to create in its readers a sufficient interest in physical science to lead them to the study of more advanced works on the subject.

A SECOND edition of "Nature's Fairy-Land," by H. W. S. Worsley-Benison (Elliot Stock), has just been published.

MESSRS. E. A. PETHERICK AND CO. have published "A Classified List" of Mr. S. W. Silver's collection of New Zealand birds at the Manor House, Letcomb Regis. Sir Walter Buller has added short descriptive notes for the information of visitors. The value of the "List" is greatly increased by a number of woodcuts, most of which are borrowed from Sir Walter Buller's "Birds of New Zealand." Mr. Silver's collection consists of birds contained in twelve cases. Of these cases eight were on view in the New Zealand Court at the Colonial and Indian Exhibition in 1886. The four cases since added contain many of the rarer species of New Zealand birds.

IN the current number of the *Mineralogical Magazine and Journal of the Mineralogical Society* there is a valuable article,

by Mr. H. A. Miers, entitled "Contributions to the Study of Pyrargyrite and Proustite." The paper, as the author explains, is the result of a study of the rich collection of red silvers in the British Museum (Natural History). The analyses have been made by Mr. G. T. Prior, and the specific gravity determinations in most instances by both Mr. Prior and Mr. Miers himself. The number also includes a paper on a peculiar variety of hornblende from Mynydd Mawr, Carnarvonshire, and a note on picrite from the Liskeard district, both by Prof. Bonney; a paper on dufrenite from Cornwall, by Prof. Kinch; and notes on some minerals from the Lizard, by Mr. J. J. H. Teall.

THE following figures show the devastations caused in the Hungarian vineyards by the Phylloxera. In 1881, 50 vineyards were infected; this number rose in 1882 to 79, in 1883 to 107, in 1884 to 237, in 1885 to 388, in 1886 to 582, and in 1887 to 811. In 1887, 132,352 acres of land were infected, the area of all the Hungarian vineyards together being 740,000 acres.

A LIST of the minerals of New York County, by B. B. Chamberlain, appears in the Transactions of the New York Academy of Sciences, vol. vii. No. 7. This list has now been reprinted. The lists of Robinson and Cozzens numbered some thirty-five minerals. That of Mr. Bailey, in 1865, embraced about forty-five titles. Mr. Chamberlain, omitting some of the less important varieties, has placed on record about a hundred names. The majority of the specimens described are from his own collection.

IN an interesting paper on the decay of the building-stones of New York City, recently read before the New York Academy of Sciences, Mr. Alexis A. Julien says it is "pitiable" to see new buildings erected in soft and often untried varieties of stone covered with delicate carvings of foliage and flower garlands, which are almost certain to be nipped off by the frost before the second generation of the owner shall enter the house. Mr. Julien points out that many of the best building-stones of America have never been brought into New York. Among the examples he mentions are siliceous limestones of the highest promise of durability, allied to that employed in Salisbury Cathedral; refractory sandstones, like some of those of Ohio and other Western States, particularly fitted for introduction into business buildings in the "dry-goods district," storage houses, &c., where a fire-proof stone is needed; and highly siliceous varieties of Lower Silurian sandstones, such as occur near Lake Champlain, quartzitic and hard to work, like the Craigleith stone of Edinburgh, and possessing the valuable qualities of that fine stone, in resisting discoloration, notwithstanding its light colour, and in remarkable resistance to disintegration.

THE French *Revue des Colonies* reports that from a plant called *Kanaff*, which grows in the summer on the shores of the Caspian, M. O. Blakenbourg, a chemist, has obtained an admirable textile matter, which is soft, elastic, tough, and silky, and which can be bleached chemically without losing these properties. The resistance of this new material is said to be far greater than that of hemp, while its specific weight is much less.

PROF. HEYDECK, of Königsberg, has been lecturing on a pile dwelling, in the Szontag Lake, in East Prussia. Ten years ago, the lake was lowered a little more than a metre. The land thus gained was cultivated, and a pile dwelling was discovered. Many flint implements were found. There was only one bronze ornament, but articles of bone were numerous. There were also vessels of clay, of which nineteen were quite uninjured.

IN our review of "The Orchids of the Cape Peninsula," by Harry Bolus, F.L.S., last week, it was noted that the omission of the publisher's name might cause inconvenience to persons wishing to purchase copies. Messrs. Wesley and Son write to us that some copies of the work have been sent to them for sale.

THE additions to the Zoological Society's Gardens during the past week include an African Zebu (*Bos indicus* ♀) from East Africa, presented by Mr. W. Mackinnon, F.Z.S.; a Coot (*Fulica atra*), British, presented by Mr. J. Cutting; a Greek Partridge (*Caccabis saxatilis*) from Bussorah, presented by Mr. Harold Hanaeur, F.Z.S.; two Red and Yellow Macaws (*Ara chloroptera*) from South America, a Greater Sulphur-crested Cockatoo (*Cacatua galerita*), a Roseate Cockatoo (*Cacatua roseicapilla*) from Australia, presented by Lady Meux; a —— Guinea Fowl (*Numida* ——) from East Africa, presented by Mr. Percy C. Reid; three Ruffs (*Machates pugnax*), two Snow Buntings (*Plectrophanes nivalis*), British, purchased; a Great Wallaroo (*Macropus robustus*), born in the Gardens.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1889 JANUARY 13-19.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on January 13

Sun rises, 8h. 3m.; souths, 12h. 9m. 6·8s.; sets, 16h. 15m.: right asc. on meridian, 19h. 41·8m.; decl. 21° 24′ S. Sidereal Time at Sunset, 23h. 48m.

Moon (Full on January 17, 6h.) rises, 13h. 35m.; souths, 21h. 31m.; sets, 5h. 36m.*: right asc. on meridian, 5h. 5·2m.; decl. 19° 52′ N.

Planet.	Rises.	Souths.	Sets.	Right asc. and declination on meridian.
	h. m.	h. m.	h. m.	h. m. ° ′
Mercury..	8 45 ...	12 52 ...	16 59 ...	20 25·2 ... 21 22 S.
Venus ...	9 52 ...	15 5 ...	20 18 ...	22 37·8 ... 9 58 S.
Mars ...	9 43 ...	14 49 ...	19 55 ...	22 21·7 ... 11 16 S.
Jupiter ...	6 11 ...	10 7 ...	14 3 ...	17 39·3 ... 23 0 S.
Saturn ...	18 25*...	1 55 ...	9 25 ...	9 26·1 ... 16 16 N.
Uranus ...	0 27 ...	5 50 ...	11 13 ...	13 22·0 ... 7 57 S.
Neptune..	12 34 ..	20 17 ...	4 0*...	3 51·5 ... 18 26 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

Jan.
17 ... — ... Partial eclipse of the Moon: visible throughout the United Kingdom: first contact with shadow 3h. 59m.: middle of eclipse 5h. 30m.: last contact with shadow 7h. 0m. About two-thirds of the moon's diameter will be obscured.

18 ... 21 ... Saturn in conjunction with and 1° 20′ south of the Moon.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.	
U Cephei	0 52·5 ...	81 17 N. ...	Jan. 13,	21 33	*m*
			,, 18,	21 12	*m*
Algol	3 1·0 ...	40 32 N. ...	,, 19,	2 28	*m*
λ Tauri...	3 54·6 ...	12 11 N. ...	,, 17,	3 34	*m*
ζ Geminorum ...	6 57·5 ...	20 44 N. ...	,, 17,	23 0	*m*
R Canis Majoris ...	7 14·5 ...	16 11 N. ...	,, 14,	0 41	*m*
			,, 15,	4 6	*m*
S Cancri	8 37·6 ...	19 26 N. ...	,, 13,	20 51	*m*
T Virginis	12 8·9 ...	5 25 S. ...	,, 14,		*M*
δ Libræ	14 55·1 ...	8 5 S. ...	,, 15,	6 44	*m*
U Coronæ	15 13·7 ...	32 3 N. ...	,, 18,	5 45	*m*
R Scorpii	16 11·0 ...	22 40 S. ...	,, 16,		*M*
U Ophiuchi... ...	17 10·9 ...	1 20 N. ...	,, 16,	5 45	*m*
R Lyræ	18 52·0 ...	43 48 N. ...	,, 18,		*M*
S Vulpeculæ ...	19 43·8 ...	27 1 N. ...	,, 13,		*M*
R Sagittæ	20 9·0 ...	16 23 N. ...	,, 17,		*m*
X Cygni	20 39·0 ...	35 11 N. ...	,, 17,	21 0	*M*
T Vulpeculæ ...	20 46·8 ...	27 50 N. ...	,, 13,	6 0	*M*
Y Cygni	20 47·6 ...	34 14 N. ...	,, 13,	17 40	*m*
		and at intervals of		36 0	
δ Cephei	22 25·0 ...	57 51 N. ...	Jan. 16,	5 0	*m*
			,, 17,	20 0	*M*

M signifies maximum; *m* minimum.

Meteor-Showers.

	R.A. °	Decl. °	
Near π Orionis	72 ...	5 N.	
,, κ Cygni	295 ...	53 N. ...	Slow, trained.

GEOGRAPHICAL NOTES.

At the Royal Geographical Society on Monday night, a paper was read by Mr. F. S. Arnot on his journey from Natal to Bihé and Benguella, and thence across the central plateau of Africa to the sources of the Zambesi and the Congo. Mr. Arnot reached Natal in September 1881, and has only just returned from his seven years' wanderings, during which he crossed the continent to some extent in the route of Livingstone. His paper forms an important supplement to the work of Livingstone, Cameron, Ivens and Capello, and the German traveller Reichart. Crossing from Natal obliquely, he struck the Zambesi near Sesheke, and ascended the river to Lealui, the town of Liwanika, to endeavour to persuade the chief to let him proceed northwards among the Batonge and Mashashe. Unsuccessful in this, Mr. Arnot left Lealui in May 1884, and proceeded to Bihé and the coast. Returning to Bihé, Mr. Arnot proceeded eastwards, crossing the interesting country from which so many rivers take their rise, flowing north, south, and west, to the Congo, the Zambesi, and the Atlantic. He touched Lake Dilolo, which he has reduced to very small dimensions, and has done something to rectify our knowledge of the sources of the Zambesi. The main stream, according to Mr. Arnot, comes from the east, and of this the Leeba is only a tributary. He stayed for two years at the capital of the kingdom of the chief Msidi, of whom and his government he gives an interesting account. Here he was in the region of the sources of the Lualaba. Msidi, who is really a native of Unyanyembe, seems a man of some ability, and is rapidly extending his power. He and Kangombe between them have almost swallowed up the once powerful kingdom of Muata Yanvo. Mr. Arnot returns to the Bangweolo region in March next.

Dr. Meyer, and his companion Dr. O. Baumann, who were recently compelled by the hostility of the natives in East Africa to take flight to the coast, actually succeeded in crossing the country of Usambara by a new route. After marching through Bondei to the mission station of Magila, they travelled for several days through a fertile, and in places thickly-wooded depression, which forms part of the Sigi basin, reaching Hanon on September 8. Crossing the Mielo Ridge they descended into the valley of the Kumba River, and on September 18 reached the valley of Mlalo, where the Umba River runs. This region is well cultivated, and covered with numerous and large villages. Proceeding to Masende, Dr. Baumann with some natives explored the mountains, arriving eventually at a fertile region inhabited by the Wambunga. These people differ completely from the Washamba of Usambara, and are a remnant of the aborigines of the mountains, speaking a dialect similar to the Kiparé.

From the new volume of the *Geographische Jahrbuch* we learn that there are now 101 Geographical Societies in the world. Of these, France and her colonies have more than any other country,—29, with 19,800 members; next comes Germany, with 22 Societies, and 9200 members; followed by Great Britain and her colonies with 9 Societies, and 5600 members. There are altogether 130 geographical serials published in the various countries of the world.

M. Jean Chaffanjon, the explorer of the Orinoco, we learn from the *Scottish Geographical Magazine*, is about to undertake a new task. He is going to explore the peninsula and lake of Maracaibo. A tribe of Indians live in the peninsula, concerning whom no scientific data have been obtained, for they allow no one to go among them. M. Chaffanjon will try to penetrate this mystery. He will also examine the lacustrine dwellings of an extinct race in the Maracaibo Lake, and then, following the chain of the Andes, will ascend to the source of the Magdalena, cross the group of mountains which separates this river from the Rio Canca, and explore the latter down to Antioquia.

SOME ANNELIDAN AFFINITIES IN THE ONTOGENY OF THE VERTEBRATE NERVOUS SYSTEM.

In the controversy respecting the ancestry of the Vertebrata the nervous system has always played an important part: that system is—I think Prof. Wiedersheim was the first to say it—the most aristocratic and conservative of all the organ systems of the animal body, and it clings to ancestral traditions more than any other. Anyone who has read Kleinenberg's marvellous account of the complicated manner in which the permanent nervous apparatus of the Annelid worm is built up from that of the larva (in which process of building up it passes through stages which can only be looked upon as ancestral), will readily agree that if we are ever to trace the ancestry of Vertebrates at all, the nervous system will probably form a significant factor in the solution.

The attempts made hitherto to homologize the nervous system of Vertebrates, either in the embryo or in the adult, with that of some Invertebrate or other, do not appear to have met with much success. To take one of the most recent of these. Prof. Hubrecht has, at the close of his *Challenger* Report on the Nemertines, indicated what he would regard as points of homology between the nervous system of this group and that of Vertebrates. The comparison is, in my opinion, exceedingly strained, and indeed it would not be difficult to show that it is absolutely erroneous.

The theory of the descent of Vertebrates from animals allied to the Tunicata was, as is well known, partially based on certain characters of the nervous system in the Tunicate larva; but that theory can now hardly be defended, since Dohrn has adduced powerful arguments for putting the descent the other way about—*i.e.* from Vertebrates to Tunicata—by insisting that the structure and development of Tunicata prove them to be degenerate Vertebrates.

As a third alternative we have a descent offered us by Bateson from Balanoglossus-like animals, with gill-clefts and a nervous system and notochord resembling that of Vertebrates. Many zoologists see the main and only resemblance between Balanoglossus and Vertebrates in the possession of gill-clefts. It is many years now since these structures in the two groups were first compared, and the supposed relationships between them more recently insisted upon do not seem to me to be of a very stable order. The nervous system and notochord of Balanoglossus are to be excluded from the comparison simply because they are on the hæmal side of the body, and therefore cannot be compared to structures which, like the nervous system and notochord of Vertebrates, are *not* on the hæmal side. As I am here only considering the claims of the nervous system to an homology, I cannot fully discuss the gill-clefts of Balanoglossus, and need only remark that a respiratory function of some part of the alimentary canal—generally the anterior part—is very commonly met with in many classes of the animal kingdom. Now, gill-clefts alone, without sense-organs, skeleton, nerves, or muscles (and these have not been described yet for Balanoglossus), are merely the results of a gut respiration, the alimentary tract having acquired openings on the lateral surface of the body, and it is by no means improbable that such openings could be acquired independently in two groups of animals otherwise widely separated. Two such groups are Balanoglossus and the Vertebrata.

The only remaining theory[1] of Vertebrate ancestry demanding consideration is that of Semper and Dohrn, which would derive those animals from Annelid worms. The first comparison concerned the nephridia; and it is to be remarked that the nervous system, the question of the homology of which has not been left in the background, has always been the great obstacle in the way of its acceptation, for no one has, as yet, succeeded in finding, in the Vertebrate, any homologue of the Annelidan supra-œsophageal ganglion. There have been plenty of wild and improbable speculations as to its whereabouts. A new era, however, opens with Kleinenberg's hint that possibly the supra-œsophageal ganglion of Annelids is suppressed even in the ontogeny of Vertebrates; and, if we concede this, we must look to the ventral chain of the Annelids as typifying the initial structure from which the central nervous system of Vertebrates arose. And now what points of agreement have been discovered between these two structures and their related nerves and sense-organs?

Eisig has compared the lateral sense-organs of Capitellidæ, which are segmentally arranged along the whole body of the animal, with the lateral sense-organs of Vertebrates. The latter arise in the head, and are at first confined to the head metameres: later they grow on to the trunk; they there become also segmental, but they are innervated by a true cranial nerve. Now, although Dr. Eisig's comparison is a very enticing one, it can be neither accepted nor rejected without further inquiry. There are many facts for it and some very important ones which, though not directly opposed to it, are not in its favour. We must attach a good deal of importance to it, for the

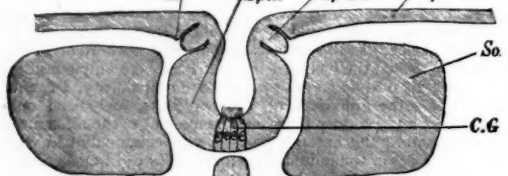
[1] Balfour ("Elasmobranch Fishes," p. 171) enunciated a different theory which can hardly now be maintained.

sense-organs of these Annelids are the only ones of which we know they in any way fulfil the conditions required of the ancestry of the lateral sense-organs of Vertebrates. It appears also that, if we admit the proposed homology as based upon the Capitellidæ, we can carry the origin of the lateral sense-organs of both groups back to still simpler structures, for it seems clear that the lateral sense-organs of Annelids have been derived from cirri and portions of the parapodial ganglia (Kleinenberg, Eisig). The rest of the Vertebrate sense-organs are easily accounted for. It is becoming more and more probable that the nose and ear are modified portions of the system of lateral sense-organs, and I am not without hopes of showing that the taste-buds of the higher Vertebrates may be derived from lateral sense-organs which wandered through certain of the gill-clefts during the development.

The eyes are not difficult to account for, as plenty of Annelids have eyes at the extreme anterior end of the ventral cord, in connection with the first ganglion.

To refer, in passing, to another structure. The Vertebrate notochord has been shown by Ehlers and Eisig to correspond with the "*Nebendarm*" of Annelida. At the risk of being pronounced a heretic, I venture the opinion that the swimming-bladder of fishes is also a derivative of the "*Nebendarm*," and that the notochord and swimming-bladder are parts of the same structure which have acquired different functions, and so developed divergently. It is certainly not difficult to raise arguments against the so universally accepted homology of swimming-bladder and lungs.

And now let me refer to some recent results of my own on the Vertebrate nervous system. I have depicted them, very diagrammatically, in the accompanying figure. It represents a



Diagrammatic transverse section through the trunk region of a Vertebrate embryo. *Ep.* epiblast; *Z. Zwischenstrang* of Prof. His; *Sp.Gl.* spinal ganglion; *Sp.c.* spinal cord; *So.* somite; *N.* notochord; *C.G.*, ciliated groove of ventral surface of spinal cord; *Ac.* gut.

transverse section through the trunk of a very young Vertebrate embryo, say a lizard; and it is designed more especially to show the nervous system. The neural tube (*Sp. C.*) is an open plate, the two sides of which are folding together; above it are seen laterally two small outgrowths (*Sp. Gl.*) not connected with the neural tube, and which have been split off from the neighbouring skin or epiblast (*Ep.*); they are growing out from the skin, and will soon be segmented off from it to form the spinal ganglia. It has usually been supposed that the cranial and spinal ganglia of Vertebrates arise as outgrowths of the central nervous system. Such is not the case; the diagrammatic figure given above partially disproves that, and it would be easy to give a series of figures which would demonstrate beyond doubt that the spinal ganglia and certain portions of the more complicated cranial ganglia arise from the epiblast outside and beyond the limit of the central nervous system, and that not a single cell of either cranial or spinal ganglia is derived from the latter. Now, the mode of development of the ganglia in Vertebrates tallies exactly with that described by Kleinenberg in Annelida for the parapodial ganglia. These latter also arise as epiblastic differentiations just above the lateral limit of the ventral cord, and, like the ganglia of Vertebrates, they appear segmentally.

Here, then, is one point of close resemblance, and not an unimportant one, between the Annelid and the Vertebrate.

Having got thus far, one is tempted to study the development of the central nervous system of Vertebrates more closely, in order to see whether other Annelid peculiarities recently discovered are represented. Of such, two have presented themselves, and while probably but the forerunners of a series yet to be unravelled, they are in themselves of the highest significance. I have represented these in the diagram in such a form that they may be easily understood; but be it remarked that they do not appear so obviously till at a later stage than that depicted.

Evidence has long been wanting of a bilateral origin of the central nervous system of Vertebrates (no doubt it is a bilateral structure—everyone, except perhaps Prof. Hubrecht, believes that), and if it is comparable to the ventral chain of Annelids, it ought to show traces of such origin in its early development. It is precisely this which I believe to have discovered.

Even before the actual closure of the two limbs of the neural plate occurs (a phenomenon which takes place much later than is generally supposed) the neuro-epithelium of the one limb does not pass directly into that of the other limb, for the two are separated below by a tract of non-nervous epiblast having the characters of a ciliated epithelium (*C.G.*). Thus, with greater truth than one can speak of the absence of primary connection between ganglia and central organ, it must be admitted that the two lateral halves of the central nervous system itself are at first destitute of nervous connection with each other. This ciliated groove (*C. G.*) is a very obvious structure in transverse sections of great numbers of Vertebrate embryos. Curiously enough, I cannot find it figured by any embryologist except His, and he does not say anything about it.

The peculiarities just described (a developing nervous apparatus composed of two bands of neuro-epithelium separated from each other by a ciliated groove) are eminently characteristic of Annelids. Nay, more; Kleinenberg states that the ciliated groove takes its origin from a double row of cells in the mid-ventral or neural line, and I am of opinion that such is the origin of the ciliated neural groove of Vertebrates. If this discovery of the double nature of the neural plate has the significance which I claim for it, the generally accepted opinion as to its primary structure must fall to the ground. The neural plate is usually supposed to be composed of two layers—an inner nervous one, and an outer ordinary non-nervous one; the inner layer is supposed to give rise to the nerve-cells, &c., while the outer epiblastic one, having unfortunately got shut in with the tube formation, has nothing left to it but to form the ciliated canal.

Both these conclusions are wrong. Years ago, Altmann showed—and it has been confirmed scores of times—that it is just those cells next the primary central canal which increase most, and so form the antecedents of the ganglion-cells. The real truth is, that the greater part of the epithelium lining the primary (as opposed to the permanent) central canal is a neuro-epithelium, for only such a one has the faculty of producing ganglion-cells on its inner side.[1]

The epithelium of this ciliated groove having developed cilia, undergoes no further differentiation for some time; *it is the only part of the primary central cylinder which is ciliated, and which does not form ganglion elements, and hence it is the only part which is not neuro-epithelium.* It forms later, by the growth and increase of its elements, *most if not the whole of the ciliated epithelium of the permanent central canal.*

In one respect the ciliated groove of the Vertebrate differs from that of Annelids—it gets invaginated along with the central nervous system; and I am not aware that any Annelid is known in which the ciliated groove is removed from the outer surface of the body, along with the ventral cords.

Now these facts are very remarkable, and, taken in connection with other points previously mentioned—such as the formation of the notochord and swimming-bladder, the lateral sense-organs, the origin of the ganglia—they furnish us with a combination of Vertebrate characters for which a parallel is to be found in the Annelida, and in no other group.

Further, we have in the nephridia of Vertebrates a series of structures which, as Semper first showed, find their parallel in Annelids. When one considers recent advances in our knowledge of the nephridia of Annelida (more especially those we owe to Drs. Eisig and Ed. Meyer) in connection with the, as yet, partially unpublished researches of Dr. Van Wijhe on Vertebrates, the justice of Semper's and Balfour's renowned comparison becomes more and more obvious.

I have shown, in a former number of NATURE (vol. xxxvii.

[1] As I write this, there occurs to me a beautiful idea of Kleinenberg's, that the ganglion-cells in the central organ which are perceptive of light have that power in virtue of the fact that they were themselves once retinal elements or parts of such elements.

p. 224), in what a marvellous manner the development of the hypophysis cerebri of Vertebrates, with its oral and neural portions, accords with the development of the permanent œsophagus and its special nervous system in Annelids. I now submit some no less striking resemblances between the two groups; and I am of opinion that we may hope, with work and increasing knowledge, to encounter many more such, as yet undreamt of.

J. BEARD.

Anatomisches Institut, Freiburg i/B., September 21.

THE JOURNAL OF THE ROYAL AGRICULTURAL SOCIETY.

IT is seldom that the Journal of an important Society so abounds with obituary notices of prominent contributors as the one now before us. The sad refrain of "*In Memoriam*" runs through but too many of the closing pages of the number, in affectionate remembrance of names which have been associated with the advancement of agricultural knowledge throughout a considerable part of this century. The late Charles Randell, of Chadbury, was essentially a farmer of the widest views and experience, and full of sympathy for scientific work. The late John Chalmers Morton, the late John Algernon Clarke, and the late John Coleman ranked among the most distinguished ornaments of the literary aspect of agriculture. The editor, remarking upon these losses, says: "It is a noteworthy but melancholy circumstance that, in the short space of six months, the three leading professional writers on agricultural subjects should have been gathered in by the Great Harvester." We should be wanting in respect to pass over unnoticed these bereavements, and when we call to mind the very recent deaths of Dr. Voelcker and Mr. H. M. Jenkins, the late secretary and editor, we must admit that this Society has sustained exceptionally heavy losses.

The present number, however, bears witness to the fact that able successors are to be found to carry on the good work of the Society, and that, as the veterans pass away, young and enthusiastic labourers step into their places.

As usual, the material of the half-yearly issue may be divided into official Reports and articles by unattached contributors. The first section includes the Reports on the farm prize competition in Northumberland; on the implements, live stock, and poultry at the Nottingham meeting of last summer; on horse-shoeing, followed by an able paper on the structure of the horse's foot by Prof. G. T. Brown, C.B.; and on the Newcastle (1887) engine trials, by the Consulting Engineer to the Society. These Reports we cannot do more than notice as well worth the attention both of mature agriculturists and students of the art. The remaining portion of the volume contains articles upon the principles of forestry, farming in the Channel Islands, the propagation and prevention of smut in oats and barley, and various papers on stock-feeding and crop-growing.

None of these papers will create more interest than that upon the herbage of old grass-land, by Dr. W. Fream, and this paper stands prominently forward as the only one which may be described as an original investigation. The question is not only important, but controversial. The best way of producing that inimitable natural product, a rich pasture, has long been a subject of vital interest to landowners. In the long period of agricultural depression, grass-lands have scarcely shared in the general depreciation of values. Good grass-land will always let, and it is likely to maintain its value. The difficulty of converting tillage land into grass has always, however, been a problem hard of solution, and anyone who throws light upon this question is deserving of gratitude.

One of the chief difficulties has consisted in ascertaining the proper descriptions of seeds for producing a permanent pasture, and a great deal of discussion has taken place upon the relative merits and demerits of the members of the large family of the *Gramineæ*, as well as of the *Leguminosæ*, compo-ing the complex herbage of a good meadow or pasture. Certain grasses have been named as especially suitable, while others, although occurring in all pastures, have been condemned as worse than useless. On the other hand, it has been freely asserted that many of our best grazing-lands are largely composed of grasses which have been stigmatized as worthless by certain authorities, and the inspection of high-class pastures has often staggered the botanist by the perverseness with which which they carried the "wrong" descriptions of grasses, and nevertheless held their own as producers of valued hay, or, if grazed, of beef, mutton, and milk.

[1] Second Series, vol. xxiv. Part 1. (London: John Murray, 1888.)

One of the most maligned of the grasses of late years has been common rye-grass. This grass, although popular with farmers, was stigmatized by Mr. Faunce de Laune, in an able paper published a few years ago, as a short-lived and inferior grass, foisted upon the farmers by seedsmen because of its cheapness and the ease with which it germinated and covered the ground. Mr. Faunce de Laune *ruined* rye-grass, his views being somewhat too precipitately indorsed by the officers of the Royal Agricultural Society, and the seed trade was ruled into unwilling obedience. Rye-grass was banished from all mixtures sown by truly enterprising and advanced agriculturists, but its use still lingered among the less scientific but more practical members of the confraternity of farmers.

In spite of this crusade against rye-grass, many observing and scientific agriculturists were in doubt, especially as rye-grass was seen to occupy a leading position in all natural pastures, and hence its evanescent or short-lived character was doubted.

Prof. Fream, partly from a desire to test the true value of rye-grass, but also with a view to investigating the botanical composition of good grass-land, put himself in communication with a number of experienced agriculturists in England and Ireland, and with their co-operation transplanted twenty-five representative sods, 2 feet long, 1 foot broad, and 9 inches deep, from as many pastures, and planted them side by side in a bed 72 feet long and 6 feet wide in the Botanical Garden of the College of Agriculture, Downton. This transplantation was accomplished in the winter and spring of 1887-88.

In the month of July the herbage of each turf was cut, and submitted to a quantitative botanical examination, with very interesting and surprising results. In the first place, these samples of pastures, brought from twelve English and eight Irish counties, gave evidence that the preponderance of their herbage was composed of two plants, one being the maligned and tabooed perennial rye-grass (*Lolium perenne*), and the other chief constituent being common white clover (*Trifolium repens*). As each of the twenty-five sods was selected from the best grass-land of its district by resident agriculturists of well-known judgment, the case appears to be conclusive in favour of the recently, but only recently, discarded grass. The actual fact is that rye-grass constituted in the various plots high percentages of the total gramineous herbage, as the following figures show:—No. 1 turf (Wainfleet), 75 per cent.; No. 2 turf (Tenterden), 90 per cent.; No. 3 turf (Sherborne), 76 per cent.; No. 4 turf (Sherborne), 77 per cent.; No. 5 turf (Somerset), 82 per cent.; No. 6 turf (Derbyshire), 18 per cent.; No. 7 turf (Somerset), 90 per cent.; No. 8 turf (Tipperary), 66 per cent.; No. 10 turf, 78 per cent.; No. 11 turf, 83 per cent.; No. 12 turf, 90 per cent. It is needless to continue this list, and it is sufficient to say that, with very trifling exceptions, these important turfs unanimously showed themselves in favour of rye-grass; in fact, this species heads the list in 21 out of the 25 cases.

Similarly, the leguminous herbage was found to contain one constituent in paramount abundance—namely, white clover; so that it may be approximately stated that, while the grassy herbage was chiefly composed of rye-grass, the leguminous herbage was chiefly composed of white Dutch clover. In one case—that of a turf sent by Sir Louis T. Delcomyn, of the Old Court, Bradwardine, Herefordshire—rye-grass and white clover composed the entire herbage, without the intervention of another plant of any kind whatsoever.

A more crushing piece of evidence against the enemies of perennial rye-grass could not well have been produced, and the farmer will once more be justified for his slowness in accepting the *dicta* of some of his would-be teachers. The case is of such practical importance that we have dealt with it at some length; and it should be added that the percentage botanical composition of the gramineous herbage of each turf is given in detail, so that the labour involved must have been very great.

Prof. Curtis, in a useful paper upon Forestry, deprecates the founding of a School of Forestry, but recommends the formation of a representative Board of Examiners in Forestry on the lines proposed by Mr. Rogers, of the Surveyors' Institution, and Colonel Pearson, to the Select Committee on Forestry. The Report on the Farm Prize Competition is of value for comparative purposes, chiefly as showing the amounts expended by good farmers upon fertilizers and feeding-stuffs, and the different practices obtaining in the locality where the competition took place. The remaining papers we cannot at present notice particularly, but have indicated their presence.

A RELIC OF ANCIENT MEXICO.

THE appearance of No. 1 of the *Peabody Museum Papers* marks a new departure in the publications of the Museum of American Archæology and Ethnology. Henceforth, Prof. F. W. Putnam states, the special papers, hitherto published in connection with the Annual Reports, will be issued in a separate but similar octavo form at irregular intervals, as the means for printing them is obtained. Part 1 of vol. i. of this new series, just received, consists of an interesting and thoughtful historical essay on a relic of ancient Mexico entitled "Standard or Head-dress," by Mrs. Zelia Nuttall, accompanied by three coloured plates. A quarto German translation by Dr. A. B. Meyer appeared in the last volume of the *Abhandlungen und Berichte des K. Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden*. It treats mainly of a remarkable piece of ancient Mexican feather-work inlaid with gold of the time of Montezuma, which was one of the first presents received and forwarded by Cortes to the Emperor Charles V. It subsequently formed part of the famous Ambras collection of historical armour, figuring in various catalogues of that collection as a "Moorish hat," an "Indian apron," and a "Mexican head-dress," and is now preserved in the Imperial Natural History Museum of Vienna. It was carefully restored by the late Prof. F. von Hochstetter, who published in 1884 a description of it as a "banner" or "fan-shaped standard," basing this identification chiefly upon the resemblance it presented to a "fan-shaped object" depicted behind the portrait of a Mexican warrior in the "Bilimek" collection acquired by the Museum in 1878. In the present essay Mrs. Nuttall adduces abundant testimony that the feather piece in question was a head-dress which formerly presented all the attributes of colour, form, and insignia of the war-god Huitzilopochtli, the hero-god and totemic divinity of the Mexicans. Such head-gear could have been worn only at the time of the conquest by Montezuma, "the living representative of the god," as "supreme pontiff and chief warrior." An exactly similar emblematic head-dress, she points out, is depicted on the so-called "sacrificial stone" as worn by Jiz-oc, one of Montezuma's predecessors. It is further maintained that the painting of the "Bilimek" warrior must be regarded as a rebus and not as a portrait. The "fan-shaped object" is the insignia of Quetzal feathers, characterizing the high rank of the warrior, who was also a priest, and is represented as clad in a human skin. The house = *calli*, piece of cord = *mecatl*, and arrows = *tlacochtl*, similarly depicted, yield, together with the Quetzal feather insignia when deciphered with the aid of the associated complementary sign, the phonetic values: (1) the surname *Calmecahua*; (2) the title *Tlacochcalcatl* = lord of the house of arrows or supreme war-chief; and (3) the tribal designation *Quetzalapanecatl*, a native of Quetzalapan, a locality near Mexico conquered by the Mexicans in 1512. This renders probable the identification of the individual as that Calmecahua, or lord of the *calmecac*, who, as Diaz relates, "fought like a lion on the side of the Spaniards" at the battle of Otumba against his natural foes the Mexicans, and was afterwards baptized as Don Antonio, and is cited by Txtlilxochitl as the author of a history of Tlaxcala, written in 1548. However this may be, it is evident that he was a *pilhua*, or head of a large family, as Mrs. Nuttall shows that the heads, surmised by Dr. Hochstetter to be those of "decapitated enemies," painted at his feet, are the usual signs for enumerating individuals, by reference to other Mexican manuscripts extant, in which similar heads under a figure are accompanied by the Nahualtl word for genealogy, and in the case of a manuscript dating about 1520, in the possession of Mr. Bernard Quaritch, by the Nahuatl text in Spanish letters = "Tenancacaltzin these his sons' heads." In an appendix to this suggestive paper Mrs. Nuttall discusses the complementary signs of the Mexican graphic system.

SCIENTIFIC SERIALS.

Bulletin de l'Académie Royale de Belgique, October 1888.—On the influence of diurnal nutation in the discussion of the observations of α Lyræ, made at the Washington Observatory, by L. Niesten. In these researches, which are somewhat analogous to his previous observations on γ Draconis made at Greenwich, the author adduces a fresh proof of the existence of diurnal nutation. The coefficient resulting from his determination is 0·095″, giving 69° east of Paris as the longitude of the first meridian.—On a new registering process by means of photography, by Eric Gérard. In this ingenious apparatus, instead of using the voltaic arc as the source of the light falling on the concave mirror whose movements have to be recorded, the inventor employs the secondary spark supplied by the Ruhmkorff bobbin. This spark being periodical, owing to the elasticity of the check-spring of the bobbin, naturally gives the division of time in equal intervals inscribed on the registering curve. In this way the use of all special chronographs may be dispensed with. The author has applied the method to the study of the variable currents supplied by dynamos with alternate currents, and has obtained excellent results.—Jean Masius contributes a memoir on the genesis of the placenta in the rabbit, with a view to the elucidation of the difficult questions connected with the origin and purpose of various elements present in the fully developed placenta.

Rivista Scientifico-Industriale, November 15, 1888.—Granular snow and the theory of the formation of hail, by Prof. Ferdinando Palagi. The author had a good opportunity of studying the phenomenon of granular snow during a heavy snow-storm at Teramo on October 20. The grains, about the size of ordinary peas, were perfectly dry, falling with a clatter like that of hail, which they resembled somewhat in appearance, although evidently formed, not by superimposed layers of ice, but by particles of snow agglomerated under certain atmospheric and perhaps electrical conditions. They were relatively light, perfectly white and opaque, yielding under pressure between the fingers, and from their general appearance and the circumstances of their formation Prof. Palagi concluded that granular snow is the first phase in the formation of hail.—On the development of electricity from the evaporation of marine water under the exclusive action of the solar rays, by Prof. Luigi Palmieri. Some recent experiments with the Bohnenberger electroscope are here described, which fully confirm the conclusions already arrived at forty years ago by the author, and in fact anticipated by Volta, regarding the origin of atmospheric electricity from aqueous evaporation.—Signor Giuseppe Terrenzi describes some remains of the beaver (*Castor fiber*, Lin.) lately discovered in the Pliocene formations of the Colle dell' Oro near Terni.

SOCIETIES AND ACADEMIES.

LONDON.

Linnean Society, December 20, 1888.—Mr. W. Carruthers, F.R.S., President, in the chair.—Prof. R. J. Anderson exhibited a photograph of an apparatus for the microscope which he had designed, consisting of a revolving disk with clips, by means of which a number of slides may be successively brought opposite the microscope, which is fixed in a horizontal position in front of it.—Mr. Clement Reid exhibited fruit of the Hornbeam from the pre-glacial forest bed at Pakefield, near Norwich, and not previously recorded as occurring in any British deposit.—Mr. T Christy exhibited a collection received from Java of hairs from the base of various ferns, notably *Cibotium Cummingii*, and a species, as supposed, of *Dicksonia*, used as a styptic, for staunching blood. Prof. Stewart, in pointing out that the use of similar material for a like purpose in China was well known to surgeons, took occasion to explain the nature of the so-called "lamb of Tartary," on which an instructive little volume had been published by the late Mr. Henry Lee, F.L.S. Mr. D. Morris remarked that the use of "fern hairs" was also known as a styptic in South America, whence specimens had been forwarded to the Herbarium at Kew.—A paper was then read by Mr. D. Morris on the characteristics of plants included under *Erythroxylon Coca*, Lamarck, with a description of a new variety, which he proposed to name, from its origin, *E. novo-granatense*. He pointed out that the well-known coca-plant had been noticed by botanists and travellers for the last 300 years; and that, although Clusius was generally regarded as the earliest writer on it, he had been anticipated by Nicholas Monardes in his "Historia Medicinal," published at Seville in 1580, and translated by Clusius, who printed it in a condensed form in his "Exoticorum libri decem" in 1605. The plant was first described as a species by Lamarck, in the "Encyclopédie Méthodique" in 1786, from specimens brought by de Jussieu from Peru. Until lately the leaves had been used merely as a nervous stimulant, like opium in China, and betel in the East Indies; but had latterly come into prominence as the source of cocaine, a valuable alkaloid possessing anæsthetic properties in contact with the mucous membrane. There were several climatic forms more or less distinct; and after describing the typical plant, Mr. Morris pointed out the characters by which *E. novo-granatense* might be distinguished. The paper was ably criticized by Mr. J. G. Baker, Mr. Rolfe, and Mr. Thomas Christy.—Mr. Spencer Moore

contributed a paper on *Apiocystis*, which he regarded as a *Volvocinea*. The ciliated form was described, and it was shown that its zoospores may sometimes escape as cœnobia, like a degenerate *Volvocinea* which has exchanged the motile for the fixed condition. The sexual cells being zoogametes, its affinity is rather with *Pandorineæ* than with oogamous *Volvoceæ*. The paper was criticized by Mr. A. W. Bennett and Prof. Marshall Ward, who, while testifying to the importance of the investigation, expressed the hope that no change would be made in classification until further examination had been made of some of the stages at a critical period of development. Mr. George Murray gave his warm support to the views expressed by Mr. Moore.—A paper was then read by Mr. G. B. Sowerby embodying descriptions of some new species of shells, of which coloured drawings were exhibited. Amongst these, the most noticeable were an *Orthalicus* from the Peruvian Andes, *Pleurotoma* (Hong Kong), *Amathina* (Mauritius), *Crassatella* (Japan), *Clavigella* (Mauritius), and *Pectunculus* (Australia). An interesting discussion followed, in which Prof. Stewart and Prof. Mivart took part, upon the coloration of Mollusca being possibly dependent upon the colour of their natural surroundings, or upon that of the host to which in many instances they were found to be attached.

Geological Society, December 19, 1888.—W. T. Blanford, F.R.S., President, in the chair.—The following communications were read:—*Trigonocrinus*, a new genus of Crinoidea from the "Weisser Jura" of Bavaria, with description of new species, *T. liratus*; Appendix I. Sudden deviations from normal symmetry in Neocrinoidea; and Appendix II. *Marsupites testudinarius*, Schl., sp., by F. A. Bather. This genus is proposed on the evidence of two calyces in the British Museum (Natural History) which were found among specimens of *Eugeniacrinus* from Streitberg. The species of *Eugeniacrinus*, *Phyllocrinus*, and *Trigonocrinus* may be arranged in a series which is apparently one of evolution. The present genus is, therefore, to be placed with the Eugeniacrinidæ, although its characters are not those of the family as heretofore defined. This is seen from the following diagnosis: *Trigonocrinus*, gen. nov. Calyx roughly triangular or trilobate in section. Basals 4, but one so atrophied as to be almost invisible; all fused into a basal ring. First radials 4; the two on either side of the smallest basal half the size of the others, thus maintaining the triangular symmetry; all closely united, with each suture-line in a groove. Processes of radials well developed, forming spines homologous with the petals of *Phyllocrinus*; except the adjacent processes of the smaller radials, which only form a minute ridge. Articular surface of radials curved gently inwards and upwards; muscular impressions indistinct or absent; no articular ridge; no canal-aperture. Arms unknown (? represented by fleshy appendages). Calycal cavity contained in first radials; with small round ventral aperture, surrounded by a rim, which is the only relic of a muscular attachment. Stem unknown. The two calyces belong to the same species, viz. *T. liratus*, sp. nov. Calyx rather more elongate than in the known species of *Phyllocrinus*; basals ornamented with minute granules; radials ornamented with similar granules run into curved ridges, which, owing to their differing intensity, give an imbricated appearance; spines, triangular in section, with the base of the triangle directed inwards, the apex outwards, the angles often rounded. The differentiation of *Trigonocrinus* from the central Eugeniacrinid type has been effected on the one hand in accordance with the principles of "Degeneration," "Reversion," and "Use and Disuse"; while, on the other hand, it exemplifies certain methods of change in organic forms, which may be referred to the categories of (1) sport, (2) hypertrophy and atrophy, (3) fusion and fission. Thus considered it is of unique interest among Crinoidea. An examination of the variations in symmetry presented by the Echinodermata suggests the conclusion that the Pentamerous type was originally evolved from another system, or at least that it was selected from among other variations, that it has survived, and that it has been kept true, as being the fittest. Appendix I. Sudden deviations from normal symmetry in Neocrinoidea. A collection of instances from previous authors, with a few additions, the whole illustrating the latter portion of the paper. Appendix II. On *Marsupites testudinarius*, von Schlotheim, sp. A synonymy of the genus *Marsupites*; it contains but one known species, and all other names must yield to this one. After the reading of this paper the President welcomed a new palæontologist to the Society, and some comments on the author's views were offered by Dr. P. H. Carpenter and Prof. Seeley.—On *Archæocyathus*, Billings, and on other genera allied thereto, or associated therewith, from the Cambrian strata of North America, Spain, Sardinia, and Scotland, by Dr. G. J. Hinde.—On the Jersey brick clay, by Dr. Andrew Dunlop.

PARIS.

Academy of Sciences, December 31, 1888.—M. Janssen in the chair.—Mean elevation of the continents and mean oceanic depths in relation to geographical latitude, by General Alexis de Tillo. Tables are given of the mean elevations and depths, in metres, for every zone of 10° of latitude from pole to equator in the northern and southern hemispheres, based on J. G. Bartholomew's hypsometric chart of the globe. The greatest mean heights and depths are found in the northern hemisphere, between 30° and 40°; in the southern, between 10° and 30°, which also correspond to the zones of greatest atmospheric action and mean annual pressure. The mean height of the dry land and the mean oceanic depth for the globe are found to be, respectively, 693 and 3803 metres.—Observation of shooting-stars for the period August 9-11, 1888, in Italy, by Père F. Denza. The results are tabulated of the records taken at twenty-nine Italian stations, showing the number of meteors observed in the space of one hour during the periodic showers on the nights of August 9, 10, and 11, 1888. These results differ considerably for the different stations, owing to the varying state of the atmosphere, the experience of the observers, and other causes; but, on the whole, the meteoric shower was tolerably copious compared with those of previous years.—On the volumes of saturated vapours, by M. Ch. Antoine. From the general relation established by Zeuner between the pressure and volume of aqueous vapour, formulas are here determined for the volumes of the vapour of water, ether, acetone, chloroform, chloride of carbon, and sulphide of carbon.—Propagation of the electric current on a telegraph line, by M. Vaschy. From a consideration of Sir W. Thomson's theory of propagation applied to long submarine lines, it is generally inferred that the currents are propagated along the line *without change of form*, their amplitude alone decreasing in geometric progression. An important practical consequence of this result is indicated for the working of telegraph lines, and this is stated to be also applicable to telephonic messages.—Action of sulphuretted hydrogen on the sulphate of zinc in a neutral or acid solution, by M. H. Baubigny. A current of hydrosulphuric gas passed through a *saturated* solution of zinc causes a portion of the metal to be precipitated; but the action is arrested when the solution becomes acid to a certain point of intensity. This statement of Berzelius is correct enough, as thus expressed. But the law deduced from its generalization for all cases is here shown to be false, and completely at variance with experience, especially when the solutions are diluted.—Artificial reproduction of chromiferous iron, by M. Stanislas Meunier. After repeated failures, the author has at last succeeded in obtaining this substance (*chromite*) by combining the protoxide of iron obtained from the carbonate with the sesquioxide of chromium obtained by the reduction of the bichromate of potassa.—A chemical study of the Algerian soils, by M. A. Ladureau. A careful analysis of samples from various parts of Algeria shows a general dearth of phosphates, which explains the inferior quality of the cereals grown in that colony.—Combination of the glycol-alcoholate of soda with glycol, by M. de Forcrand. The author has already shown that many alcoholates unite with one or more molecules of a monatomic alcohol to form more or less stable crystalline compounds analogous to the acid salts, and to the numerous hydrates of the salts, bases, or acids. Here, he shows further that glycol may combine in the same way with the glycol-alcoholate of soda at equal equivalents.—On the active crystalline substance extracted from the seeds of the smooth or hairless Strophanthus of the Gaboon, by M. Arnaud. An analysis of this substance, used by the Pahouins (Fans) for poisoning their arrow-heads, shows its close affinity to the wabaine of *Acokanthera Wabaio* from Somali-land, and the strophanthine of *Strophanthus Kombé*, from Senegambia, previously described by the author.—Biological and therapeutic experiments on cholera, by M. W. Loewenthal. A series of experiments undertaken last year with the cholera bacillus seems to show that salol might be advantageously administered both as a prophylactic and a therapeutic during the prevalence of the cholera epidemic.—On a deposit of fossil bones in the Island of Samos, contemporaneous with the Pikermi age, by Mr. Forsyth Major. This find is the result of a scientific exploration of some islands in the Ægean in the year 1887. It comprises some forty species of mammals, some of

which have been identified beyond doubt with members of the Pikermi fauna. Amongst them are the Ictitherium (three species), a mastodon (*M. pentelici*), a rhinoceros, a hipparion (*H. mediterraneum*), *Sus erymanthius*, and seven antelopes. Representatives were also found of the two families of Edentates still living in the Old World; a gigantic Ruminant belonging to the giraffe family, but forming a new genus (*Samotherium boissieri*, Major); and an ostrich (*Struthio karatheodoris*, Major), equal in size to the largest members of the *Struthio camelus* group.

BERLIN.

Physical Society, November 30, 1888.—Prof. Kundt, President, in the chair.—Prof. Neesen spoke on a photographic method of registering the oscillations of projectiles. The conical end of the projectile is hollow, and at the point of it there is a small round opening; a sensitive photographic plate is placed in the cavity of the projectile. If the latter is now fired towards the shining sun, a ray of light must fall on the centre of the sensitive plate as long as the projectile moves horizontally; any deviation in a vertical or horizontal direction must produce an elongated image on the plate, and from this the deviation of the projectile from its true flight may be determined. If the projectile rotates in its flight a spiral will be obtained on the plate. The speaker had made some preliminary observations on rotating and vibrating hollow conical balls, and exhibited the negatives which he had obtained. The rotation of projectiles presents great difficulties, inasmuch as in a series of experiments the sensitive plate must not participate in the rotatory motion. The arrangements necessary for securing this result were described. Experiments as above described must be of the greatest interest in connection with the theory of projectiles, since up to the present time but little is known of the extent of the vertical and horizontal deviation during flight.—Prof. Neesen also gave an account of a stroke of lightning whose effects he witnessed while on a journey last summer. The lightning struck the centre of the roof of a two-storied house, passed along externally for a short distance, then made a round hole through the wall, and came upon the hook from which a mirror was suspended; it then passed over to the glass, fusing it at the upper corner, in the middle where the two halves of the glass joined, and at the lower opposite corner, and finally passed out again through a round hole in the wall below the glass. The way in which the latter was injured by the lightning was especially remarkable, as also was the way in which the lightning, instead of passing straight along the outside of the wall, made its way by one hole to the looking-glass in the room, and then passed out again by another similar opening.

Physiological Society, December 7, 1888.—Prof. du Bois-Reymond, President, in the chair.—Prof. Munk continued the communication which was interrupted at the last meeting of the Society, on the physiology of the thyroid.

December 21, 1888.—Prof. du Bois-Reymond, President, in the chair.—Dr. Barth gave a detailed description of his method of preparing the membranous labyrinth, and exhibited a series of preparations which had been made by this method. He intends to study fully the minute anatomy of the internal ear with the help of these preparations.—Dr. Weyl gave an account of his researches made with a view to determining the toxic or harmless action of the colouring-matters derived from tar. Inasmuch as the German Statute-book only forbids the use of two of these colouring-matters derived from tar as being poisonous, the speaker had made a systematic examination of an extended series of these colours, including such as might possibly be employed for the coloration of food-materials and might hence be a matter of dispute. He first tested the nitroso-and nitro-derivatives of benzol and phenol, and found the first to be non-poisonous, taking phenyl green as a typical representative. The nitro-derivatives which he examined—namely, picric acid, dinitro-kresol, and Martius's yellow—he found to be poisonous; the sulpho-compounds of the last-named colouring-matter, of which two are now articles of commerce—namely, naphthol-yellow S, and brilliant-yellow S—he found to be harmless. This fact points to a relationship between the chemical constitution and physiological action of these bodies. He busied himself further with an examination of the azo-colours, of which many hundred are used commercially. These fall naturally into two groups—namely, one in which the colouring substances contain only one azo-group, and a second in which they contain the azo-group twice, or as it may be called the Congo-group. These groups are distinguished physiologically by the fact that the first does not impart any colour to the urine, while the second does; they are further distinguished technically by the fact that the first group can only be used for dyeing by the help of a mordant, whereas the second does not require the use of any mordant. Dr. Weyl first investigated the action of substances containing one azo-group—namely, aurantia or imperial-yellow of commerce (hektanitro-diphenylamine); this colouring-matter was non-poisonous, and remained so after it had become soluble by the introduction of the sulpho-group (HSO_3) into its molecule. In the above researches the speaker used fibres of wool or silk, either mordanted or not according to the nature of the colouring-matter, for the purpose of determining their presence in the fluids and urine from the animals on which he was experimenting, dipping the threads into the fluids: he found that the commencing coloration of the fibres was the most certain sign of the presence of the colouring-matter.

Note.—In NATURE for December 13, p. 167, column 2, the sixth line from the bottom of the page, instead of "fall" read "rise."

AMSTERDAM.

Royal Academy of Sciences, December 29, 1888.—Mr. J. A. C. Oudemans criticized the value of the retrogradation of the plane of Saturn's ring, determined by Bessel in 1835, and generally adopted also for the plane of the orbits of the inner seven satellites of that planet. He remarked that Bessel's value 3″·848, being exceeded by its mean error, is not trustworthy. He prefers the theoretical value, for which he finds 0″·25.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

A Text-book of Elementary Biology: R. J. H. Gibson (Longmans).—Chance and Luck, new edition: R. A. Proctor (Longmans).—The Photographer's Diary and Desk Book, 1889 (Wyman).—A Text-book of Physiography: E. Hull (Deacon).—The Telephone: W. H. Preece and J. Maier (Whittaker).—Triennial Calendar of the Tungwen College (Peking).—Descriptive Catalogue of the Sponges in the Australian Museum, Sydney: R. von Lendenfeld (Taylor and Francis).—Corona; the Bright Side of the Universe: F. T. Mott (Williams and Norgate).—Manual of Orchidaceous Plants, Part 4, Cypripedium (Veitch).—Explosion of an Air Receiver at Ryhope Colliery (Newcastle-upon-Tyne).—The Anatomy of Megascolides australis (the Giant Earth-worm of Gippsland): W. Baldwin Spencer (Melbourne).—Journal of Anatomy and Physiology, January (Williams and Norgate).—Mind, January (Williams and Norgate).—Quarterly Journal of Microscopical Science, December (Churchill).—Quarterly Journal of Royal Meteorological Society, October (Stanford).—Geological Magazine, January (Trübner).—Journal of Society of Telegraph Engineers and Electricians, No. 75, vol. xvii. (Spon).—Journal of the College of Science, Imperial University, Japan, vol. ii. Part 4 (Tōkyō).—Proceedings of the Society for Psychical Research, Part 13 (Trübner).

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